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Cornelia Thierbach, Anna Laura Raschke,
Linda Hering & Nina Baur (Eds.)

Spatial Analysis in the Social Sciences
and Humanities. Towards Integrating
Qualitative, Quantitative and
Cartographic Approaches

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Special Issue: Spatial Analysis in the Social Sciences and Humanities

Theory and Methods in Spatial Analysis. Towards Integrating Qualitative, Quantitative and Cartographic Approaches in the Social Sciences and Humanities

Nina Baur, Linda Hering,
Anna Laura Raschke & Cornelia Thierbach [*]

Abstract: *»Theorie und Methode der Raumanalyse. Ein Vorschlag zur Integration qualitativer, quantitativer und kartographischer Ansätze in den Sozial- und Geisteswissenschaften«.* A main obstacle for integrating the methodological debates on spatial analysis in diverse social sciences and humanities (such as Sociology, Geography, History and Cultural Studies) is the lack of a common definition of research goals and theories of space. Starting from the discussion on absolute and relational space concepts as well as the observation that space is a multi-level-phenomenon consisting of different spatial layers which interact with time layers, the authors argue that all spatial problems can be categorized into one of five dimensions: (1) Thinking and Imagining Space; (2) Creating and Changing Space; (3) Experiencing, Appropriating and Orientating within Space; (4) (Inter)Action and Distribution within Space; and (5) Relations and Movements between Spaces. The authors discuss the contribution of various qualitative approaches (e.g. ethnography, case studies and discourse analysis), quantitative approaches (e.g. surveys, public administrational data and GIS) and cartographic approaches for analysing these dimensions and conclude with open questions for future research.

Keywords: Spatial analysis, space, theory, method, ethnography, case studies, survey methodology, maps, GIS, cartography.

[*] Nina Baur, Technische Universität Berlin, Department of Sociology, Fraunhoferstraße 33-36 (FH 9-1), 10587 Berlin, Germany; nina.baur@tu-berlin.de.
Linda Hering, Technische Universität Berlin, Department of Sociology, Fraunhoferstraße 33-36 (FH 9-1), 10587 Berlin, Germany; linda.hering@tu-berlin.de.
Anna Laura Raschke, Technische Universität Berlin, Department of Sociology, Fraunhoferstraße 33-36 (FH 9-1), 10587 Berlin, Germany; anna.raschke@tu-berlin.de.
Cornelia Thierbach, Technische Universität Berlin, Department of Sociology, Fraunhoferstraße 33-36 (FH 9-1), 10587 Berlin, Germany; cornelia.thierbach@tu-berlin.de.

1. Choosing the "Right" Method for Spatial Analysis

During the process of institutionalization of different academic disciplines and research fields after World War II, the analytic category *space* was attributed to disciplines like Geography, Geodesy, Regional, Urban and Transport Planning; the category *time* to History; while the categories of *present societies and cultures* were attributed to disciplines like Sociology, Ethnology and Cultural Studies. As a result, *space* was henceforth neglected in the academic discussion of the latter disciplines (Massey 1999; Wallerstein 1999). This does not mean that *space* did not play a role as an analytic category in those research fields. For example, within Sociology, the subfields of Architectural, Rural, Urban and Regional Sociology have always been explicitly analysing human activities within their respective spatial units (i.e. buildings, cities and regions). At the same time, most other subfields of Sociology (especially Sociology of Inequality, Life Course Research and Social Structural Analysis) have been focusing on another spatial unit (the nation state) and have been analysing both regional differences within the nation state and – in the form of cross-cultural or international comparative research (Baur 2014a, in this HSR Special Issue) – between different nation states, mainly in the Western world.

Due to the *Spatial Turn* in the 1990s (Döring and Thielmann 2008; Dorsch 2013) *space* was rediscovered as analytic category within all the above disciplines. However, although there have been many *theoretical debates* and *empirical studies* within the above fields of research about the meaning and relevance of space, even today the debate is surprisingly un-integrated: debates remain fixed within their respective fields. Interdisciplinary discussion is still the exception and so far has not resulted in a common cohesive analytical framework.

Even more startling is that despite the long history and large quantity of empirical studies using space and spatial concepts as an analytical category, there is no systematic debate on *methodology and methods of spatial analysis*. This is even more surprising, as by now, there is a broad and thorough knowledge on many methodological problems concerning spatial analysis. This is true especially for three types of methodological approaches, each of which have focussed on one specific method and excelled in this.

1.1 Maps and other Cartographic Approaches

Social, Cultural and Economic *Geography and Geodesy* have been using a broad range of qualitative and quantitative methods. Due to the advances in Geographic Information Systems (GIS) and Geoinformatics in the last ten years (Martin 2009), quantitative spatial methods (Fotheringham et al. 2007, 2009) have progressed and gained in importance not only for Geography but also for other disciplines as well since the early 2000s. Stressing that the choice of

methods depends on the focus of analysis, geographers typically distinguish between studies that aim at analysing

a) the physical structure of space and buildings (*morphogenetic analysis*),
b) the symbolic meaning of space (*symbolic analysis*),
c) images and representations of space (*cognitive maps* or *mental maps*),
d) the ways space is used (*functional analysis*), the way people act or a distributed within a specific spatial unit ("Sozialraumanalyse" – *analysis of social space* or "Sozialberichterstattung" – *social reporting*),
e) the way people and goods move within and between space ("Aktionsraumanalyse" – *analysis of action spaces*) or
f) how these dimensions of analysis interact (Heineberg 2006, 13-24, 143-66).

What all these approaches have in common is that they use the *map* (Dünne 2008; Fotheringham et al. 2007, 65-92) as the focal point of analysis – here data and analytic results are typically represented (e.g. Hänsgen et al. 2010; Hitzke 2013). Another way of representing results are *statistical measures* (Fotheringham et al. 2007, 30-64; Fotheringham et al. 2009).

1.2   Ethnographic and other Qualitative Approaches

In her introduction to methods of social research for members of the Chicago School of Sociology (Häußermann and Siebel 2004, 45-54), Vivian M. Palmer (1928) suggests ethnography (Knoblauch 2014) – meaning mixing (participant) observation (Thierbach and Petschick 2014) with other qualitative and quantitative methods (like documents, surveys etc.) – as a suitable method of spatial analysis. Palmer (1928) also propagates the extensive use of maps as a reference frame for recording and comparing results from various data sources.

Examples of the application of Ethnography are the early studies of the Chicago School (Deegan 2001), such as "The Gang" (Thrasher 1927) or "The Jack Roller" (Shaw 1930), British studies such as Elias and Scotson's (1990) "The Established and the Outsiders" and famous German studies such as the studies on Marienthal (1931-1933) (Jahoda et al. 1933) and Euskirchen (1952-2002) (Mayntz 1958; Friedrichs et al. 2002).

Ever since, Architectural, Rural, Urban and Regional Sociology, but also Ethnology and Cultural Studies, have mainly relied on qualitative methods of social research, especially ethnography. Typically, empirical studies take the form of case studies (Baur and Lamnek 2005; Muno 2009; Hering and Schmidt 2014). This holds true even for newer studies that use other theoretical approaches. An example is Baur's et al. (2014) study on economic practices within cities, which puts the theoretical approach of the *Intrinsic Logic of Cities* to the test (Berking and Löw 2008; Frank et al. 2013).

1.3   Surveys and other Quantitative Approaches

Since the 1950s, *survey research* has become the main data source for most other fields of Sociology. When cross-national research increased, it became apparent that legal conditions, response behaviour and field conditions differ enormously between and within countries, thus making it highly unlikely that the same questionnaire, sampling method, survey mode and field method can be (sensibly) applied in all countries – a point that Baur explores in more detail elsewhere in this HSR Special Issue. Hence, *Cross-Cultural Survey Methodology* has become a large and dynamic research field within the last 20 years (Pennell et al. 2010; Rippl and Seipel 2008, 57-77, 94-5). One of the more recent developments are collaborations with Geodesy in order to better define the properties of spatial data (Haining 2009), on combining geodata with social science data (Lakes 2010) and georeferencing and/or regionalizing "ordinary" survey and process-generated data (Hintze and Lakes 2009; Grözinger and Wenzel 2010) in order to make a combined analysis possible.

1.4   Integrating the Methodological Debates

While each of these subfields have gained enormous methodological knowledge in specific methods used within the respective field and have established field-specific standards of analysis, this knowledge remains unknown to other fields – resulting in methodological blind spots.

It is therefore time to integrate these methodological debates, and this HSR Special Issue aims at being a first step in promoting this discussion. Specifically, we want to explore which methods are best suited for approaching space in the social sciences (seeing space as either dependent or independently variable), which sampling strategies, data types and analysis strategies are appropriate for spatial problems and how different traditions of analysis (namely qualitative, quantitative and cartographic approaches) can be integrated.

However, when thinking about these questions, one needs to know what one wants to analyse. The question of method thus becomes a question of theory. It becomes clear that another neglected debate backfires: the theoretical debate on how *space* and *spatial problem*s are to be grasped by analysis.

Although we cannot and will not try to solve these theoretical questions, we argue that social scientists still need a common framework (Baur 2008) which is not theory itself, but which helps to compare social theories and link them with both methodology and research practice (Baur 2009a). Using such a framework, researchers can classify their theoretical and research goals, determine the appropriate data and methodologies for answering their question (Baur 2008, 2014). So which dimensions should such a framework for spatial analysis have?

2.   Dimensions of Spatial Analysis

2.1   The Social Construction of Space and the Problem of Locating the Social in Research Practice

As both social theory (Löw 2001; Shields 2013) and Geodesy (Haining 2009) point out, there is no "natural", given space – there are only places ("Orte") and relations between objects and places, or – in the terminology of Geodesy – specific *time-space-coordinates*. Places become space and therefore a category of research through the processes of *spacing* and *synthesis* (Löw 2001, 158-9), meaning that people arrange themselves and objects in specific places and relations to one another thus creating a mutual area of being and relating. *These arrangements* can be rather rigid and subject to little change (e.g. administrative borders around communities or countries) or temporary, but they *are always socially constructed and geographically fixed*. This in turn has implications on at least four stages of the research process (see also Graph 1):

Graph 1: Locating the Social in Empirical Research
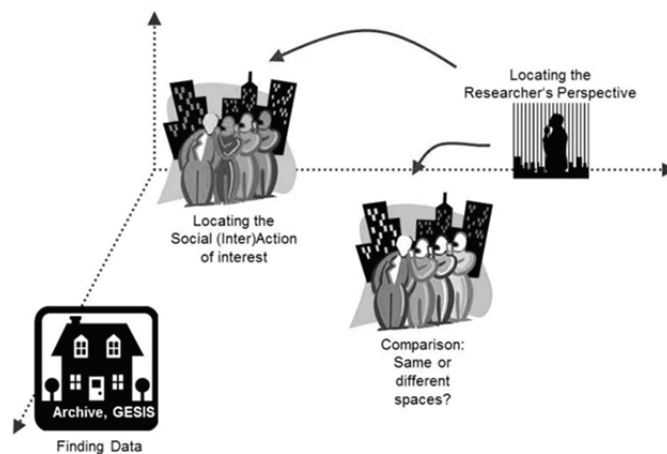
a) *Data Collection*: Data have to be collected somewhere by somebody from someone (else) about something or someone (else). For example, an interviewer visits a respondent at their home and interviews them. In order to do so, researchers have to identify the space-time-coordinate where a specific interview partner can be found and contact them there. It is also important to keep in mind whose (spatial) representations of whom or what are collected, i.e. to distinguish between (a) the time-space-coordinates where data is collected and (b) the time-space-coordinates on which data is collected. For ex-

ample, respondents in Germany might be asked what they think about German politics. In this case, both sets of time-space-coordinates are the same. However, Germans might also be asked what they think about French politics.

b) *Archiving*: Often, researchers do not collect their own data but instead conduct a secondary analysis of other researchers' research-elicited data (such as ISSP) or use process-produced data such as media data or public administrational data (Baur 2009b). These data are not just "there". Instead, they are "somewhere", i.e. located at a specific space-time-coordinate, e.g. an archive (such as the Data Archive for the Social Sciences at GESIS)[1] or a research data centre. In order to be used for research, they have to be found and accessed. Without knowing the space-time-coordinate of this storage place, data would be lost, especially as the place of data collection and the place of archiving are seldom the same. Note that this is even true for data on the internet: They have to be stored on some computer space at a specific space-time-coordinate.

c) *Data Analysis*: There are different questions researchers might ask about space, as we will discuss below. In order to answer these questions, empirical researchers typically use data to analyse spatial constructions or behaviour of people within space or between spaces. In order to conduct these analyses, data is classified as belonging to the same space or to a different space. E.g., we talk about *cultural differences* between Germany and France, if in a survey respondents in Germany (i.e. one set of time-space-coordinates) on average answer in a different way than respondents in France (i.e. a second, different set of time-space-coordinates). In contrast, if data from one German survey and a different German survey give different averages (i.e. both sets of data are collected at the same set of time-space-coordinates), we might instead assume that there is a measurement error or ask why else there are conflicting results.

d) *Researcher's Subjectivity*: As a researcher's subjectivity always influences his perception of reality and can never be completely controlled (not even in quantitative research), it is important to analyse how subjectivity frames perception (Baur 2008). The researcher's (as a person's) specific time-space-coordinates (and especially the relation of these time-space-coordinates to the research object) play a crucial role:

    a) *Perspectivity ("Perspektivität"):* The first important step in social science research always is to define one's research perspective that is to define a research question as "relevant" and "interesting" and to address this question from a certain theoretical stance (Baur 2008). We know that different national schools traditionally prefer specific theoretical stances (Münch 1994; Connell 2007; Rodríguez et al. 2014), and also

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[1] <http://www.gesis.org>.

that questions deemed as socially relevant and worthy of research vary depending on cultural context. For example, 9/11 and its social consequences was a much more interesting research question for Americans than for Europeans, while in Europe the social consequences of the Euro crisis is seen as a much more relevant question than elsewhere.

b) *Partiality ("Parteilichkeit"):* While all researchers are part of their own society and – due to the specific society's history and current social problems – likely to deem specific research questions and theoretical stances as especially relevant, it is important to clearly state one's perspective and specific theoretical stance on the space that is the object of one's research. This is especially important in order to distinguish necessary perspectives from prejudices and other variants of partiality that distort research because researchers are so entangled in their own value system that they systematically misinterpret or even peculate data. Researchers are particularly prone to prejudices and blind spots when researching a culture other than their own (i.e. a set of time-space-coordinates foreign to them). For example, post-colonial theorists (Connell 2007; Rodríguez et al. 2014) frequently complain that Americans and Europeans assume that other Southern and Eastern societies are "backward" and "traditionalist" and that they unthinkingly transfer theoretical concepts to foreign spaces, even if they are not applicable.

c) *"Verstehen":* Subjectivity is also necessary to understand the meaning of human action (and data in general). In order to have the facility to understand social interactions, researchers need a minimum of knowledge of the culture of interest, although in general they have a better implicit understanding of their own society, as both Hermeneutics (Herbrik and Kurt 2014) and Ethnography (Fetterman 1998) have frequently pointed out.

In summary, in order to conduct empirical research, data has to be collected from someone on someone/something in order to draw conclusions on someone/something – and all these people and things are located somewhere.

2.2   Absolute and Relational Space

When conducting spatial research, one is confronted with a distinction that appears to be crucial to some: the distinction between absolute and relational space (Löw 2001). We argue that there is a deep misunderstanding between advocates of the two concepts: Seeing space as socially constructed does *not* mean denying the existence of physical space. Neither does it mean that space is a fluid entity that cannot be grasped over time.

In fact, many socially constructed spaces are rather firm constructions that are structured by institutionalized principles and are far from quickly changing, e.g. national states. Space can thus have all aspects of a *container* (Einstein

1960), a mere frame for social action that might (or might not) influence social life, an *independent variable*.

For example, quantitative researchers typically draw random samples from *statistical populations* and later draw inferences from their data on these populations. As can be read in any introductory book to statistics, populations have to be defined with regard to contents, temporally and *spatially*, i.e. they address a specific set of people and/or things being located at a specific time on a specific spatial unit demarcated by borders from other spatial units.

When space is seen as a container, researchers typically ask (1) how people act or interact with people and artefacts in this space and how they are distributed within different special arrangements, or (2) the way they move within and between spaces.

With the observation that *space* is a social construct and a practice, space becomes a *relational category*, and analysis can be focussed on how this social construction of space actually works. The category *space* itself is the main interest of analysis. It is – in the terms of quantitative methodology – the *dependent variable*. Specifically, research can ask (3) how people imagine, think about and remember space; (4) how they construct, create and change space and (5) how people experience, orientate within and appropriate space.

We plead for a relational concept of space, i.e. for seeing *space as a social construct*, as we believe that this concept allows for addressing both sets of research questions: from a relational point of view, *absolute spaces* in the sense of containers are just a special mode of constructing space. The differentiation between relativistic and absolutistic views on space vanishes in favour of a relational view on spaces (Lefèvbre 1974; Löw 2001, 268-71; Löw 2010). If one accepts this viewpoint, future research has to ask what this means for research *practice* – especially in those research fields that methodologically use the concept of space as a container. We address this issue in more detail in sections 6 and 7.

To sum up, in order to compare research questions and studies that deal with space, we suggest the following dimensions for a *framework for spatial analysis:*
1) Imagining Space
2) Creating Space
3) Experiencing and Appropriating Space
4) (Inter)Action in Space
5) Relations and Movement between Spaces.

2.3   Space as a Multi-Level Phenomenon

As stated above, both social theory (Löw 2008b) and Geodesy (Haining 2009) point out that one of the things we do when constructing space is to synthesize elements on specific time-space-coordinates to different spaces with differing scopes all localized in the same place. As Berking (2006) for example points

out, there is always a local grounding of any seemingly global phenomenon, combining the local and the global into an unbreakable entity.

In methodological terminology, this means that *time-space-coordinates are aggregated to spatial units*. As Graph 2 illustrates, the size of the spatial unit that the time-space-coordinates are aggregated into can vary, ranging from a room to a building, quarter, city, region, nation, or to the whole globe.

A single time-space-coordinate can also belong to different spatial units of different aggregation levels at the same time. For example, when introducing yourself to a stranger you may state your home as your city of origin whereas when explaining the same to someone local, you would specify the part of town you live in.

Space therefore is a *multi-level phenomenon*, and the different *spatial layers* ("*Raumschichten*") are entwined (Schulz-Forberg 2013). Some of the methodological problems resulting from this observation are further addressed by Baur elsewhere in this issue.

Graph 2: Space as a Multi-Level Phenomenon

Location (Time-Space-Coordinate)
Quarter
City
Region
Nation
Globe
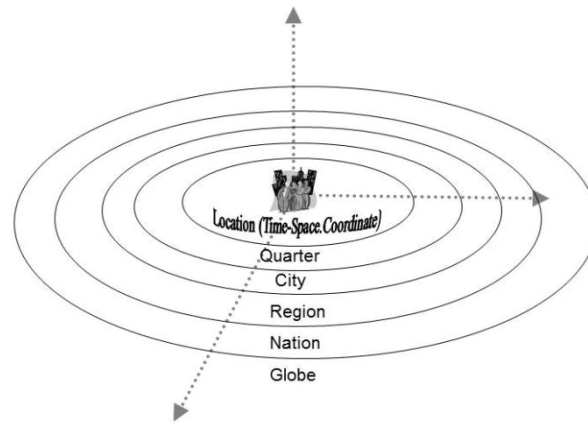
2.4   Space and Time

Space and time are inseparably entwined (Elias 1984, 72-5; Giddens 1984; Sturm 2000; Massey 2005; Baur 2014; Weidenhaus 2014), as was explicated in one of the last HSR Special Issues on "Space/Time Practices" (Dorsch 2013).

Taking the interrelation of space and time into account, it becomes clear that at a given point in time, the materiality of the surroundings structures action and interaction as humans are bound in space and time by their body and thus at least partly constrained by a given (physical) environment and their fellow humans. Each person and object can only be at one spot (i.e. at a specific time-space-coordinate) at a given time, and moving them through (physical) space

from one time-space-coordinate to another takes time (Baur 2013c) which is why specific *space-time-paths* can be observed (Giddens 1984; Cromley 1999, 64-82, 104-16; Pohl 2010).

At the same time, *humans can change space over time*. Two early examples are Norbert Elias' (1939 [1997]) analysis of territorial concentration and nation building due to the civilizing process, and Fernand Braudel's (2001) analysis of how humans not only changed territories but even the geography and climate of the Mediterranean over the centuries, which in turn influenced later societal and individual possibilities of action. In other words: Over time, local practices and knowledge are solidified via the physical (especially: built) environment.

A more recent example is the German approach of the *Intrinsic Logics of Cities* (Berking and Löw 2008) which postulates that cities are a specific form of spatial-temporal condensation of people and things, set into motion by so-called formative phases and reproduced via everyday practices over a very long period of time. These subtle but structuring practices have effects on the built environment as well. Using this theoretical approach, Berking and Schwenk (2011) and Hering (2014) identify the formative phases of various cities and analyse how they are reproduced and changed over time.

When analysing the interrelatedness of space and time, it is important to take into account the *spatial layer* ("*Raumschicht*") (Schulz-Forberg 2013) and *time layer* ("*Zeitschicht*") (Koselleck 2000) or "durée" (Braudel 1958) which the analysis focusses on, because not all spatial and time layers can be addressed with the same methods (Baur 2014) as the following examples illustrate:

1) Spatial process that take place in the *longue durée* (i.e. over centuries or millennia) can only be addressed with process-produced data such as documents, public administrational data, artefacts, buildings, landscapes and maps (Baur 2009b; Baur and Ernst 2011).

2) For *medium-term processes* which take place during an individual's lifetime, qualitative interviews and longitudinal survey designs might be additional data sources.

3) Ethnography is (usually) only suitable for grasping *short-term processes* such as spatial practices and interaction in space.

When linking these temporal patterns with the above-mentioned questions one might ask about space, it becomes clear that not all of them address the same time layers equally and thus it is not surprising that very different methods have been used for addressing them. For example, experiencing and appropriating space (dimension 3 of the framework suggested in section 2.2), acting in space (dimension 4) and moving within space (dimension 5) typically take on the short and medium time layer. In contrast, the physical environment is usually only created and changed (dimension 2) over years, decades and centuries while processes of thinking and imagining space (dimension 1) might take place on all time layers.

However, assessing the perfect relation of *spatial layer*, *time layer* and *method* is an open question for future research. For now, we will content ourselves with exploring each of the five spatial dimensions of analysis in the following sections and discuss how each of the methodological traditions introduced above (cartographic approaches, qualitative approaches and quantitative approaches) have contributed to addressing these dimensions of spatial analysis.

3.   Imagining Space

3.1   Cartographic Approaches

A first analytical goal of spatial analysis starts with the observation that *space* is always a social construction of the human mind (Lefèbre 1974). Methodologically, this is relevant for two reasons:

First, any scientific analyses of space have to work with representations of space that in themselves are already socially constructed, which again might influence results (Harley 1992): Cartographers encode the "real world" on a map which is then again decoded by the receiver, e.g. reader of the map, and here ambiguities and misinterpretations are possible (Pickles 1992).

For example, cartography typically projects three-dimensional physical space into a two-dimensional map and afterwards represents things of interest on the map, e.g. borders, landmarks, buildings, people etc. (Cromley 1999; Lorenz et al. 2010, 2013a, 2013b). However, this is already a complex task.

For example, one of the problems with representing the physical world on a topographic map is that the globe is not flat, meaning that during projection some parts of the world necessarily are distorted in size – the researcher has to decide which parts of the world these are using different (e.g. Robinson, Eckert, Mercator and Peters) projection methods. For example, Graph 3 shows a topographical map of the world using the Robinson projection; Graph 4 uses the Peters projection.

Note how the projection method influences how big each of the landmasses appears and how the continents seem to differ in their relative sizes, depending on the projection method. For example, Antarctica seems to be bigger, while the British Isles appear smaller in comparison to other landmasses in the Peters projection than in the Robinson projection.

Graph 3: Robinson Projection of Three-Dimensional Physical Space into a Two-
        Dimensional Map

Source: Canuckguy et al., based on BlankMap-World6.svg [Public Domain], via Wikimedia Com-
mons <http://commons.wikimedia.org/wiki/File:BlankMap-World6,compact.svg?uselang=de>
(accessed December 14, 2007).

Graph 4: Peters Projection of Three-Dimensional Physical Space into a Two-
        Dimensional Map
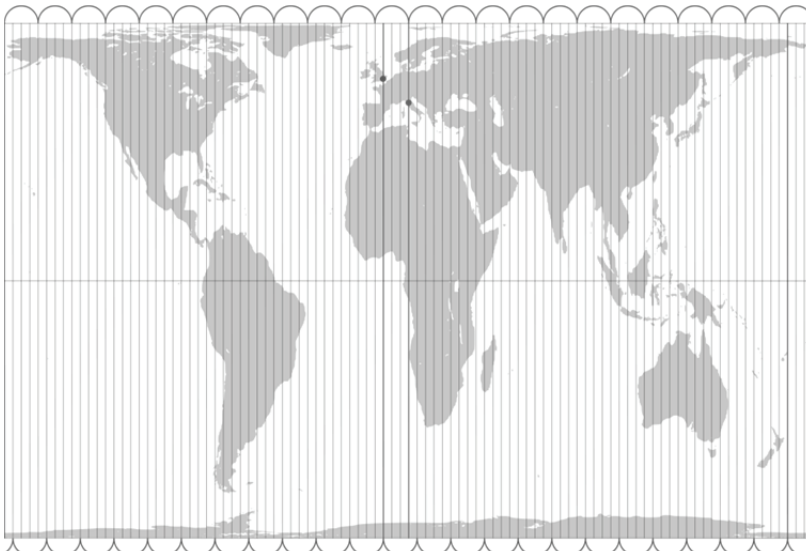
Source: mate2code [Public Domain], via Wikimedia Commons. <http://commons.wikimedia.org/
wiki/File:Peters_projection,_date_line_in_Bering_strait.svg?uselang=de> (accessed December 14,
2007).

This is methodologically important, as many analyses use these topographical maps as a basis for further analysis, and the untrained eye might not notice these aspects of the maps and interpret them as "objective facts", although in fact they are open to multiple interpretations (Scholl et al. 2014, in this HSR Special Issue).

Apart from asking how to perfectly represent space on a map (in the sense of causing as little distortions and misleading clues as possible), researchers might, secondly, ask *how people themselves construct space in their minds – that is how they imagine, think about and remember space and how they represent space* (Sturm 2000).

While this is seldom done quantitatively, there are both cartographic and qualitative approaches to address these questions. Within Geography, Archaeology and Architectural Sociology, *symbolic analysis* focusses on the symbolic meaning of spaces.

Very often, this is done by taking *artefacts* (Schubert 2014), *buildings* (Reinle 1984; Gottschall 1987; Bentmann and Müller 1992; Steets 2010) and *landscapes* (Cosgrove and Daniela 1988; Duncan and Duncan 1992) as *social facts* and analysing them by observing them in detail. The idea is that people only put the effort in building something or changing a landscape if this is important to them, i.e. if there is a meaning to it – and (using *hermeneutical methods*) (Herbrik and Kurt 2014) analysis aims at deconstructing the hidden meaning of these artefacts or things.

An early example of the analysis of buildings is Norbert Elias' (1969) inquiry of the "Palais" in the Ancien Régime in the "Court Society". By studying these buildings and comparing them to modern flats, he concludes that (in contrast to the modern nuclear family based on the idea of romantic love) husband and wife in noble French families formerly lived separate lives and organized their everyday lives (including buildings) in order to only have to meet for official functions.

Similarly, in "The Age of the Cathedrals" Georges Duby (1985) analyses landscapes and shows that the sheer size of religious buildings (cathedrals) in empty landscapes was enough to inspire awe in the eye of the beholder.

In addition to physical objects, researchers might use other data sources for symbolic analysis, e.g. *documents* or *maps* (Harley 1992; Pickles 1992). Pickles (1992) illustrates that simple map characteristics (like the colouring) can influence the viewer e.g. for propaganda purposes.

Even if maps are not intended for propaganda purposes, they reveal a lot about the cartographer's world perspective. For example, cartographers typically place what is most important to them at the centre of the map, meaning that on a European world map, Europe is typically in the centre, on an American world map it is North America, and some Australian maps are even drawn upside down (with Australia in the centre). Due to projective distortions, Eu-

rope seems tiny on these reversed maps – suggesting to the viewer that it is unimportant.

By comparing maps over time, changes in local perceptions can be revealed. For example, before World War II, representations of Berlin typically centred the map around Alexanderplatz in the city's east (which was in fact the city's historical centre). Areas west of Tiergarten, a large park in the middle of the city, typically did not appear on the map at all. After World War II, the city became divided and Alexanderplatz became part of East Berlin. West Berlin's centre moved to Ernst-Reuter-Platz and Bahnhof Zoo, west of Tiergarten. Subsequently, these areas were placed on the centre of maps in Western representations of Berlin. After the fall of the Berlin Wall and the unification in 1990, the town centre moved east again, however not as far east as Alexanderplatz but to the new governmental area around the new main station somewhere in the middle between Alexanderplatz and Ernst-Reuter-Platz which is why in modern maps, Tiergarten and this area are placed in the middle of maps.

While symbolic analysis uses existing data (e.g. buildings, maps) as a base of analysis, geographers and other social scientists have developed techniques of *cognitive maps* or *mental maps* as a means of grasping how people imagine space (Friedrichs 1977, 302-13; Carter 1980, 373-96; Downs and Stea 1982; Heineberg 1996, 163-6; Conrad 2002). Typically, interview partners are either given a blank piece of paper in order to draw a map on it or they are given a topological map and are asked to draw borders and objects into these maps. Further, these maps are typically analysed by using qualitative methods (Schrettenbrunner 1974).

Examples of studies using this method are Lynch's (1965) study of the "Image of the City", Fichtinger's (1974) enquiry of images of Munich school children about nearby lakes and Schreiner's (2000, 47-74, 158-89, 210-87) analysis of how inhabitants of Berlin perceive the borders of their neighbourhoods and how this influences their everyday behavioural patterns.

As an alternative to these methods well established in geography, Scholl et al. suggest elsewhere in this HSR Special Issue the use of *ethnography* to better grasp the relational aspects and the role of presence and absence in space constructions.

3.2 Qualitative and Quantitative Approaches

While Geography and Cartography have historically started their approaches to representations and images of space methodologically with the map, Sociology has begun with theory, typically asking first whose *representation of space* is to be grasped before asking secondly which *method* is to be used to address this question.

Often, the same methods are used as in Geography, i.e. *symbolic analysis*, *cognitive maps* and *mental maps*. However, the data sources differ: maps, arte-

facts, buildings and landscapes are often supplemented with or substituted by *other qualitative data* such as documents and interview material. Very often, additional questions are asked, e.g. how spatial representations have changed and developed, why these changes took place and what results they produced. In these cases, research designs often take the form of *case studies* and *discourse analysis*.

One focus of analysis has been the *scientists' world perspective* (Häußermann and Siebel 2004). For example, rereading and analysing classical German urban sociological *texts*, Martina Löw (2008a) illustrates that many urban sociologists actually do not analyse the city but either societies as whole or city quarters.

A second focus of analysis is how *city concepts that architects and urban planners* have changed over the centuries and are entwined with societal changes. Here, typically *symbolic analysis of maps* is combined with *other data sources* (e.g. Carter 1983, 114-29; Schäfers 2006, 187-98; Löw et al. 2008, 93-122). Alternatively, *discourse analysis* based on interviews and documents is pursued (e.g. Rodenstein 1992; Strom and Mollenkopf 2004).

Graph 5: Karlsruhe (built in 1715) as an Example of a European Aristocratic City Conception
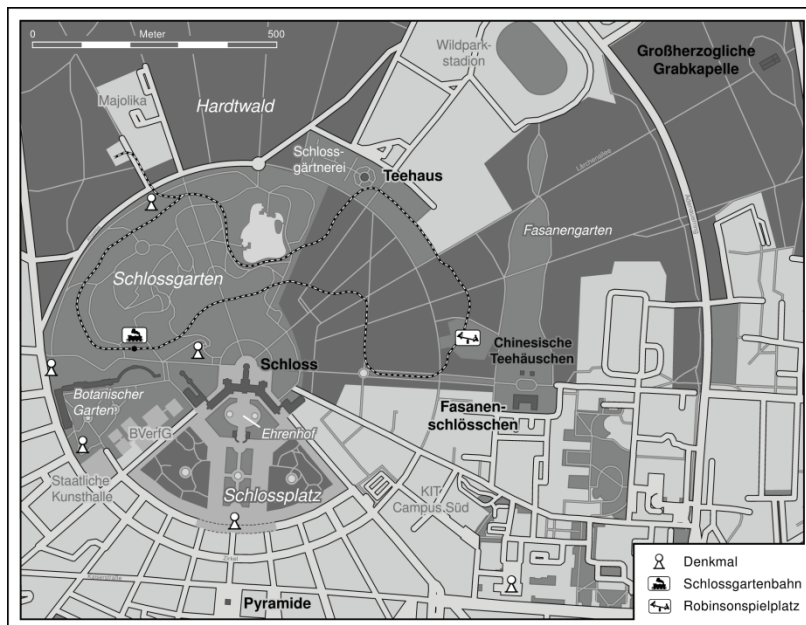
Source: Mmmmmicha at de.wikipediaOpenStreetMap contributors [CC-BY-SA-2.0], via Wikimedia Commons <http://commons.wikimedia.org/wiki/File:Karte_Schloss_Karlsruhe.png?uselang=de> (accessed August 19, 2010).

For example, European medieval and early modern urban planners believed the King and nobility to be the centre of society. Thus, cities were typically built with a palace or other representative building in the city centre. From here, the city was built like sunbeams around this building with the most important buildings and richer areas around the center and the less important and poorer areas further away from the center, as the map of Karlsruhe, which was founded in 1715, illustrates (Graph 5). Other examples of the so-called "Aristocratic City" are Palma Nuova (1598), Oradea (1617), Dorsten (1633) and Berlin (1710).

In contrast, American city planners wanted to physically represent their democratic views that all men are equal in the way they built their cities. They thus characteristically used a grid system, as the example of Baltimore in 1888 illustrates, as here no streets seemed to be more important than others.

Graph 6: Baltimore (1888) as an Example of an American Democratic City Conception

Source: Meyers Konversationslexikon 2: 299 (1888).

Not only planners, but also whole societies conceptionalise themselves spatially in a specific way (Carter 1983, 114-29; Löw et al. 2008, 66-71), as Kaufmann (2005) illustrates in the case of the United States, drawing on a mix of

various data sources. Often these *(spatial) representations of self* use maps as a means of propaganda.

This is even truer for the *(spatial) representation of others* (Pickles 1992; Harvey 1992; Dünne 2008), as negative representations of others and drawing borders between them and oneself have often been used as a means for the social construction of territories since nation building started in Europe (Schenk 2002). For example, analysing academic *texts* on Europe, Boatcă (2005, 2007) demonstrates that American and European academics have been trying for over a century to construct "Western Europe" as something positive, i.e. modern, economically efficient, democratic and with open-minded religions, while "Eastern Europe" was negatively constructed, i.e. as traditional, economically underdeveloped, undemocratic and with narrow-minded religions. Mallard 2014 (in this HSR Special Issue) also re-reads scientific texts in order to grasp the imaginary spaces of science. A *symbolic analysis* of the maps used in these academic texts shows that researchers also assign geographical areas to the "West" and to the "East" rather crudely, ignoring political territories, culture and history. For example, Huntington (cited in Boatcă 2005, 2007) draws a line right through countries such as Romania and at the same time puts Orthodox Christianity and Islam into the same religious category without any further explanation.

Additionally, other methods have been used for analysing the representation of self and others in space. For example, Gehring and Großmann 2014 (in this HSR Special Issue) suggest *discourse analysis* (drawing on a *combination of interview data with newspaper articles*) in order to grasp cities' self-representations. Using these data, one can also illustrate that cities define their problems and problematic quarters within them very differently (Barbehön 2013; Barbehön and Münch 2013). An alternative is c*ombining visual representations of the city and interview data* in order to appropriate the self of a city (Marent and Richter 2013).

Rauscher 2014 (in this HSR Special Issue) analyses literary self-representations of urban life worlds, using contemporary *crime novels* as her main data source and *combining the methods of close and distant reading, basic instruments from corpus linguistics and qualitative and quantitative content analysis.*

Other studies, e.g. Elias and Scotson's (1990) work on "The Established and the Outsiders" and Löw's and Ruhne's (2011) study on prostitution focus on how specific areas in a town are interactively defined as "bad" areas. In order to do so, Elias and Scotson (1990) *mix ethnography with documents, official crime statistics, qualitative interviews and maps* (Baur and Ernst 2011), while Löw and Ruhne (2011) *combine ethnography with qualitative interviews.*

The spatial representations discussed so far were typically linked to physical space via the map (Dünne 2008). However, the analysis of societies' spatial representations illustrates that it is in fact possible to imagine a *social space* (Schultheis et al. 1996) without linking it to physical space. The most famous example is Bourdieu's (1989) concept of the social and symbolic space. As

Graph 7 illustrates, this conception of space represents different social groups in relation to their typical activities and goods and the forms of capital they possess or lack. This is in fact one of the few examples where representations of space are grasped mostly quantitatively, using *surveys* as a data base and condensing them using *correspondence analysis* (Baur and Lamnek 2007).

Graph 7: Social Space (Pierre Bourdieu)
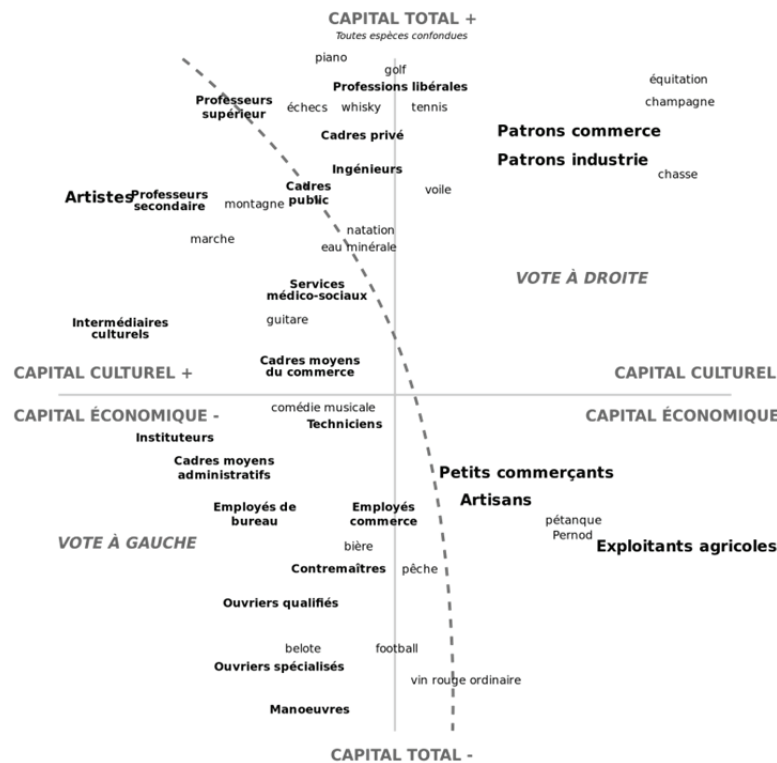
Source: Nicolas Lardot, simplified and inspired by "raisons pratiques, seuil, coll. points, 1996: 21" [GFDL or CC-BY-SA-3.0], via Wikimedia Commons <http://commons.wikimedia.org/wiki/File:Espace_social_de_Bourdieu.svg?uselang=de> (accessed November 10, 2006).

The observation that social space can be perceived without a relation to physical spaces in combination with the development of the internet and computer games have resulted in a final research strand on spatial representations: the construction of *virtual and imaginary space*. One first surprising result is that, although it is not necessary to imagine space with a relation to physical space (as the example on social space above illustrates), most representations of virtual and imaginary space regardless use physical space as a relation. For

example, representations of virtual cities and landscapes look like maps of the "real world" (Löw et al. 2008, 51-92).

Therefore, current research focuses on the question of why that is, typically combining *symbolic analysis* of maps with *ethnography* or *videography*. A good example is Röhl's and Herbrik's (2008) analysis of the way imaginary space is used in fantasy role-playing games. They show that maps of the imagined world (resembling topological maps of the real physical world) are used as a link of placing people (who typically sit around a table in the real world while playing), or more precisely: people's imaginary characters into the imaginary world. This makes visualizing the imaginary world easier and also defines the characters' limits of action, as – like people in the real world – characters can be only at one place at a given time in the imagined world. Finally, players use maps to plan and coordinate joint activities. All in all, the map acts as an intermediary between real and imagined world and thus enables the collective construction of space. Röhl and Herbrik (2008) argue that these are not just a central function of maps of imaginary or virtual spaces but also of maps in general which is why representations of space have such a powerful effect on space-related actions.

4.   Creating Space

4.1   Cartographic Approaches

People do not just imagine space. (Physical) space is created, shaped and changed by human practice – sometimes intentionally guided by human imagination, sometimes as an unintentional by-product of other human (inter)actions. For example, humans might intervene into "natural" physical space by constructing transport routes and buildings, mining, lumbering and afforesting woods, enclosing and tilling fields, regulating rivers or by overgrazing and thus desertificating land. As the studies by Braudel (2001) and Duby (1985) mentioned above illustrate, humans thus do not only build towns and cities but also might transform whole landscapes over the centuries.

Typically, new and re-constructions of physical space build on and transform earlier constructions. For example, unless hit by disasters, fire or war, cities are rarely completely erased. Instead, buildings are torn down and replaced by new buildings one at a time or block by block, or new quarters are added at the fringes of towns. Additionally, often the materials used from torn down structures are re-used. Therefore, in times of peace, a town's *Gestalt* is highly persistent and changes – if at all – only gradually. Only due to certain events (e.g. war, fire), can the *Gestalt* change rapidly. E.g., Berlin gives examples for both types of change (Engel 1980; Schnedler and Schneider 1980; Berning and Braun 2003; Bodenschatz 2010).

By analysing *maps* and the *physical environment, morphogenetic analysis* tries to trace these changes of the physical structure of space and explain why some structures change quickly, why others change slowly, how the physical environment influences political, social, economic and technical developments and how it functions as a *frame of social action* (Carter 1980, 177-203, 277-91; Heineberg 2006, 143-8, 199-255). Again, Braudel's (2001) analysis is a good example – while he explains in his first book how the Mediterranean was transformed by human action, he illustrates how this formed social life in the second volume, showing that for centuries European social life was centred on rivers and the sea, as they provided the only method of fast transport. In the third volume, Braudel shows that these geographically formed social and political structures posed a severe problem for Philipp II, as his empire was the only European empire with a territory scattered over diverse geographical regions. Therefore it sometimes took approximately two years or more to simply send a message which made practical politics almost impossible.

Graph 8: Morphogenetic Analysis. Two Maps of Canalport, Chicago (1857 and 1928)

CANALPORT IN 1857
Adapted from Davis' Map of 1857

ECOLOGICAL MAP OF CANALPORT, 1928
Plotted on Social Research Base Map. Business centers plotted from Hart's
Land Values, 1928. Types of dwellings plotted from the City Building Map.
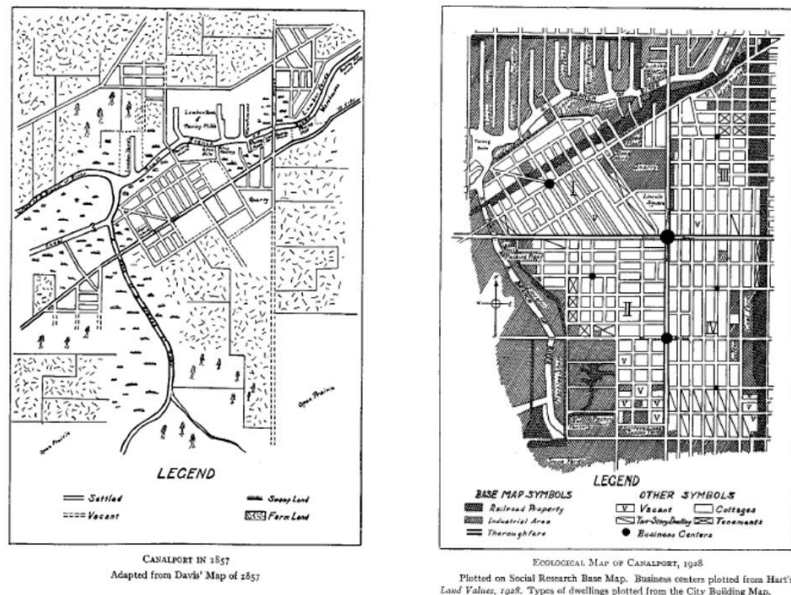
Source: Palmer (1928/1929), 220 & 224.

However*, morphogenetic analysis* is not exclusive to geography. Palmer (1928, 64-9, 189-91, 218-23) also suggests this as a method for Sociology. E.g., Graph 8 shows how Canalport, one of Chicago's quarters, has changed between 1857 and 1928. Even the lay person can make out the signs of urbanization: The city

has grown in size. Fields have vanished and been replaced by roads and houses. The arms of the river have been enlarged and straightened in order to enable larger ships to dock at the harbour area.

4.2   Qualitative Approaches

Most modern sociological analyses take a different stance: Equivalent to analyses on imaginations of space, analyses of creation of space do not tend to ask primarily *how* space changes over time but *who* changes it, how and why. Empirical studies have focused on various social groups such as residents (Häußermann et al. 2002), politicians (Häußermann 1992; Rommelspacher 1992; Dangschat 1992), city marketers and the tourism industry (Pott 2005; Landgrebe and Schnell 2005), global companies (Roost 2008) and – although seldom – (urban, regional and landscape) planners (Betker 2005a, 2005b) and – even more seldom – those actually involved in the creation process such as cartographers, architects, construction engineers (Suchman 2000; Dienel 2006) and other scientists (Mallard 2014, in this HSR Special Issue). A new approach is presented by Christmann and Lelong 2014 (both in this HSR Special Issue) by focusing on entire actor constellations involved in spatial transformation processes.

In these studies, researchers often assume that the physical environment and social processes are entwined, especially when it comes to synthesizing time-space-coordinates to spaces, institutionalizing spaces, drawing borders and defining rules for being admitted to and using spaces (Löw 2001, 166-72). For example, prohibition to enter a given space is often enforced by are mixture of physical structures (e.g. doors, gates, fences, walls) and social interactions (e.g. gate keepers and doormen who may keep away undesired persons).

Methodologically, most studies draw on the *case study method* using *documents* and *interviews* as main data source. However, a few studies on cartographers, architects, construction engineers suggest that *ethnography* and *video analysis* might be also suitable methods for analysing the everyday work practices of those creating space (Knoblauch and Heath 2006). Christmann and Lelong 2014 (both in this HSR Special Issue) suggest advancing this method by drawing on a combination of data (e.g. problem-centered interviews, documents, participant observation, standardized data) in order to conduct *qualitative network analysis* (Lelong) or *ethnographic discourse analysis* (Christmann).

5.   Experiencing and Appropriating Space

Even after *space* has been created, it is no "objective" or unchangeable entity that is simply there. Instead, before using space, human beings have to experience and orientate themselves within spaces. For example, children have to

learn what space is and how to use it during socialization (Zeiher 1983, 1990; Schmitz and Neidhardt 2001). Additionally, humans have to appropriate space, i.e. to decide which (physical) space to use and how to use it. In doing so, they either choose to accept the ideas and rules for using space as intended by those who created the space or they re-define the space according to their needs and spaces (Zeiher 1983, 1990; Lange 2007). As stated above, people might interactively draw social boundaries where there are no physical boundaries, for example between the *holy* and the *profane* in religious ceremonies (Baur 2013d, 2013e, 2013f).

This analytical dimension of spatial analysis somewhat overlaps with the dimensions of imagining and creating space, or better: interacts with them, as typically imagining, creating, experiencing and appropriating space is a dynamic circular process, with each aspect of spatial behavior influencing the others over time (Baur 2013g). Still, in our opinion, it makes sense to analytically distinguish this dimension from the other two, as research questions concerning this dimension are typically addressed *methodologically* differently.

5.1 Cartographic Approaches

In cartography, the question of appropriating space is typically tackled via *functional analysis* (Carter 1980, 85-177; Carter 1983, 150-70; Heineberg 2006, 148-9, 167-98). Different functional categories are marked on maps in order to visualize the use of buildings, traffic paths, or areas. The marked categories depend on the research question. This approach became increasingly popular within urban geography after the 1960s and centered mostly on the analysis of business districts in inner city areas (Heineberg 2006, 17). For example, Heineberg (1977, 13-29, 89-151, 176-206) analyses which buildings in East and West Berlin are used for which (economic) purposes. In line with the method, research results are visualized by marking on a map which types of business each building is used for.

5.2 Qualitative and Quantitative Approaches

Sociological studies on experiencing, orientating within and appropriating space so far have two analytical foci:

Researchers either analyse how a specific *social group experience space*, e.g. children (Zeiher 1983, 1990; Ahrend 2002, 34-53, 69-111, 144-58, 197-206), youths (Herlyn et al. 2013, 15-45, 112-43, 218-46; Schmals 1999, 2000), young adults (Gothe and Pfadenhauer 2010), the elderly (Edinger 2014, in this HSR Special Issue), cultural entrepreneurs (Lange 2007) or scientists (Mallard 2014, in this HSR Special Issue).

Alternatively or at the same time, research asks *how this appropriation of space works in practice*. For example, Funke-Wieneke (2008), Zeiher (1983, 1990) and Ahrend (2002) show how space is experienced by physically moving

one's body through it. Reh and Temel (2014, in this HSR Special Issue) also concentrate on the appropriation or – as they call it – the *doings* of space. However, their analytical foci are material arrangements (such as buildings and architecture) instead of specific groups of people.

Another research strand analyses how people use maps for *synthesizing time-space-coordinates* to space, for *placing* and *orientating* themselves within this space and for *wayfinding*, stressing that these processes are results of social interactions (Rapaport 2002; Gordon 2007; Laurier and Brown 2008; Edinger 2014, in this HSR Special Issue; Thierbach and Lorenz 2014, in this HSR Special Issue; Lorenz et al. 2010, 2013a, 2013b).

With the exception of Ahrend (2002), who uses *qualitative interviews*, all studies use *ethnography* or *video analysis* as a main method, as most practices of appropriating space are so strongly habitualised that people could not talk about them, although ethnography is often combined with either interviews or focus groups. Edinger (2014, in this HSR Special Issue) suggests additionally triangulating *ethnographies* and *interviews* with *mental maps*, *photo documentation*, *architectural analysis* and other visual data. Using an experimental design, Thierbach and Lorenz (2014, in this HSR Special Issue; see also Lorenz et al. 2010, 2013a, 2013b) *mix ethnography with survey data and mental maps* in order to be able to link residents' spatial practices with cartographic practices.

6.   (Inter)Action in Space

The research strands we have discussed so far all have in common that they take a relational perspective on space and treat space as a dependent variable, i.e. asking how space is being (re)constructed by humans over time in a threefold process of imagining, creating and appropriating space.

In contrast, most research fields in the social sciences and humanities typically do not explicitly address space. Because – as we have discussed above – any social research is spatially bound, space has to be addressed somehow in *research practice* and is typically treated as a given earth-bound container. Although it is not clear if these researchers have a theoretical concept of space at all or if they completely lack a concept of space, the way they treat space implicitly strongly resembles the concept of an container (see also Baur 2014a; Chan-Tack 2014, both in this HSR Special Issue): Space is conventionalised as a given entity, in which something happens. In this sense, *space is either the independent variable*, as its properties might influence, enable or constrain human (inter)action –, *or it is seen as a frame of reference in which social (inter)action takes place*. Thus, in these cases, the research interest is not space itself but what happens within space.

Although there has been a lot of experimentation with spatially flexible data sets in the last two decades (e.g. Schräpler 2009, 2011; Chan-Tack 2014, in this

HSR Special Issue), this approach is still unusual today. Instead, these research questions typically have in common, that they methodologically link to the concepts of space discussed so far:

1) *Researchers define a given space as a frame of reference*. Typically, they use topological projections of physical space on maps, e.g. the Robinson projection discussed above (Graph 3).

2) *Researchers divide the frame of reference into units of analysis*. These *spatial units* are typically conceptionalised as *(target) populations* in quantitative methodology, as they are thought of as a group of people and things bound to a specific physical space. E.g., in Graph 9, the world map is divided into areal units of equal size. Note that this is not what is typically done. Instead, usually politically defined administrational units are used, e.g. nation states, regions, cities or quarters. As Baur 2014a (in this HSR Special Issue) discusses in more detail, these units are often of very different geographical and population sizes. For example, compare the relative sizes of China with Germany and Luxembourg. As Chan-Tack 2014 (in this HSR Special Issue) demonstrates, the choice of (the wrong) areal unit can severely distort statistical results. In Geodesy, this is called *MAUP (Modifiable Areal Unit Problem)*. The areal units should be ecologically valid, i.e. relevant to the social processes under examination (Chan-Tack 2014, in this HSR Special Issue).

3) *The researchers select one or more units of analysis for detailed analysis*. Using qualitative, quantitative and mixed methods approaches, they draw samples of and collect data on people and things of the selected unit(s) of analysis in order to describe what is happening within this spatial unit as frame of reference.

Graph 9: Division of Frame of Reference into Areal Units and Selection of a Single Space within Frame of Reference for Detailed Analysis
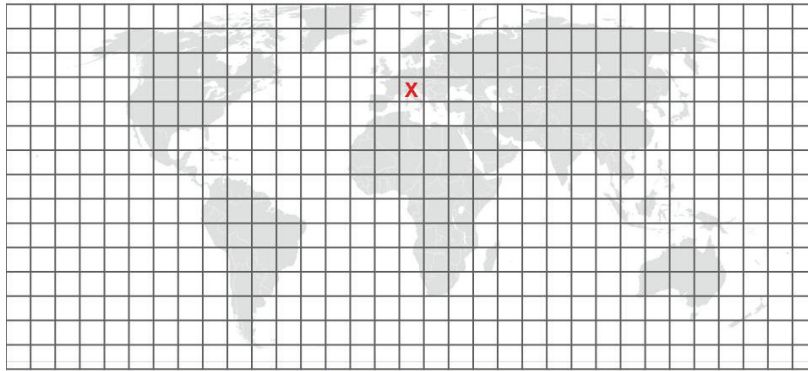
Source: Own Creation, based on map by Canuckguy et al. based on BlankMap-World6.svg [Public domain], via Wikimedia Commons <http://commons.wikimedia.org/wiki/File:BlankMap-World6,compact.svg?uselang=de> (accessed December 14, 2007).

6.1   Qualitative Approaches

Urban sociology typically selects one unit of analysis (e.g. a city) and examines this in detail (see Graph 9) by combining *ethnography* with all kinds of other available data such as *maps*, *documents*, *life stories* and *qualitative interviews*, *public administrational data*, *time budgets*, *surveys* and other *standardized data* (Palmer 1928). Examples are the studies in Marienthal (1931-1933) (Jahoda et al. 1933) or the early studies by the Chicago School (Deegan 2001), such as "The Gang" (Thrasher 1927) or "The Jack Roller" (Shaw 1930).

One of the problems of these single-case studies is that for *generalisation, abstraction and theory-building*, one needs more than one case in order to able to look for differences and common patterns (Baur and Lamnek 2005; Hering and Schmidt 2014). These studies thus have typically made use of *comparison* ("*Vergleich*") in four ways: *Researchers can compare …*

1) *… their findings with predictions from social theory.* If a specific study's results differ from these predictions, the reason could either be mistakes in the research process, or this city could be a special case, or the theory needs to be modified (Hering and Schmidt 2014).

2) *… lower aggregation levels of the spatial unit with each other* in order to learn more on the spatial unit of interest (*Within-Case-Variation*). For example, urban sociology very often compares different quarters of a city in order to learn something about the city as a whole (Häußermann and Siebel 2004).

3) *… their findings with those from studies on other spatial units of the same aggregation level at the same time (Between-Case-Variation I = Cross-Cultural Research).* For example, there are many studies on the economic structure and its effect on social inequality within a specific city. By comparing the results of the studies on all these cities, one can try to learn something on the relation of urban economies and social inequality in general.

4) *… their findings with those on the same spatial unit of the same aggregation level at a different time (Between-Case-Variation II = Historical Comparison and Longitudinal Research).* There are two problems with this approach: (a) It assumes that the spatial unit remains constant over time – an assumption that is, as we have discussed above in detail, highly questionable (see also Baur 2014a; Scholl et al. 2014; Chan-Tack 2014, all in this HSR Special Issue). (b) Social change in these spatial units usually only takes place over a very long time-span, and in order to make proper comparisons it would be methodologically preferable if the same method was used. With ethnography, the problem is that one can only observe in real-time. Still, today there are several impressive examples of studies that managed to analyse processes of urban change using ethnography: the Chicago School produced a large number of single-case studies between the 1920s and the 1960s, which together can be read as a description of social change in Chicago over time (in a similar way as the studies on *different* cities can be read

as an example for cross-cultural comparison). There are even more systematic and sophisticated approaches that take the form of an *ethnographic panel with the city as the unit of analysis*. For example, some classical studies have been replicated by (mostly) the same team of researchers conducting a second or even third ethnography in the same city some years or decades later. They could thus show which social practices and structures have changed and which have been replicated (Baur 2014). The time spans sometimes cover several decades, for example about 50 years for Euskirchen (1952-2002) (Mayntz 1958; Friedrichs et al. 2002). Within this time-span, methodology has sometimes changed from ethnographic approaches to quantitative approaches, for example Wolfsburg (1959-2010) (Herlyn 1967; Herlyn et al. 1982; Herlyn and Wulf 2000; Harth et al. 2000, 2010).

6.2   Cartographic and Quantitative Approaches

Like many qualitative studies, there are also quantitative studies that select one single spatial unit and collect (quantitative) data on a (preferably random) sample of people and things within this spatial unit. Examples are opinion polls and surveys on citizens of a nation state, the methodological problems and some of the solutions being the same as discussed in the previous section.

Graph 10: Comparing and Classifying Spaces
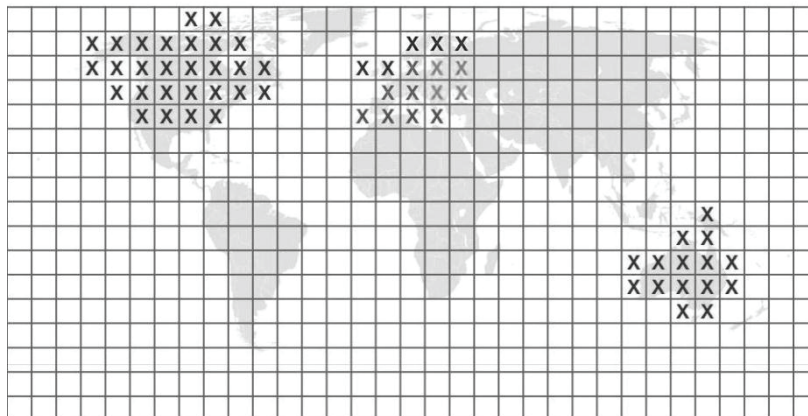
Source: Own Creation, based on map by Canuckguy et al. based on BlankMap–World6.svg [Public domain], via Wikimedia Commons <http://commons.wikimedia.org/wiki/File:BlankMap-World6,_compact.svg?uselang=de> (accessed December14, 2007).

However, quantitative and cartographic approaches have come up with an additional solution for this problem: as Graph 10 illustrates, *researchers can analyse the whole population or at least a sample of spatial units in order to*

compare and classify their distribution within the respective spaces (Friedrichs 1980, 87-92).
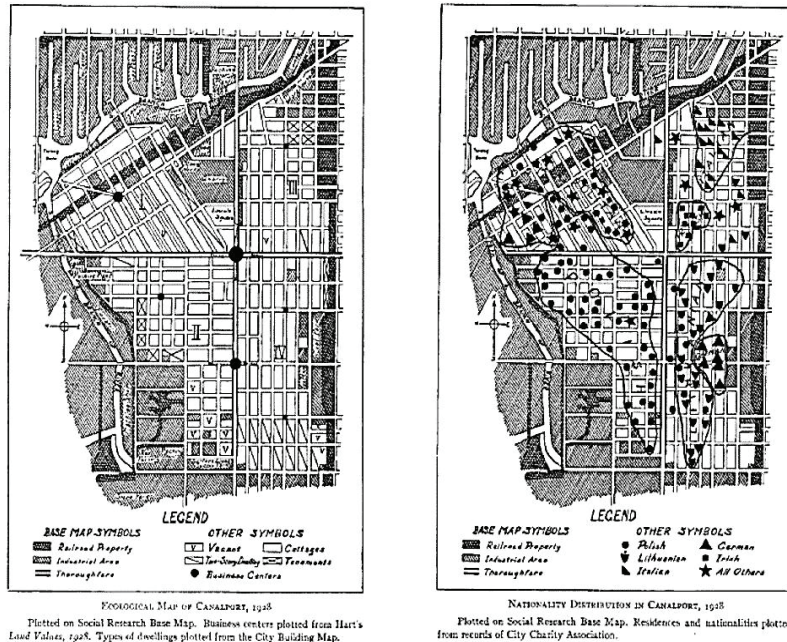
Using the example of Canalport's ethnic population in 1928 (Palmer 1928, 70-81, 185-91, 222-7), Graph 11 illustrates how this is typically carried out: Using physical space as a frame of reference, researchers draw a random sample of the population living in this space and conduct a survey. Respondents' answers to survey questions can be either statistically analysed and summarized in a measure, or can be represented on the map. For example, Graph 11 gives an early example of ethnic segregation: Canalport's inhabitants tended to choose to reside in areas where other members of their own ethnicities tended to live.

Although today's representation techniques and statistical procedures are more sophisticated, the principal method is still the same, regardless of the *aggregation level of the spatial unit*:

1) For example, there have been analyses of *Social Spaces ("Sozialraumanalysen")* and *Social Accounting Analyses ("Sozialberichterstattung")* (Mardorf 2006; Heineberg 2006, 150-9) in the form of a comparison of unemployment rates in *different quarters of the same city* (e.g. Koell 1986; Häußermann and Kapphan 2004).

2) Methodologically, this is the same as what cartographers, sociologists and public administrators regularly do for *different regions within the same country*, such as Germany (e.g. Albrecht 2010; Wingerter 2009; Holst and Schupp 2009) and what …

3) *… international and cross-cultural comparative research* does for different world regions (e.g. OECD 2009, 154-5; OECD. 2010, 140-3). For example, Graph 12 represents the unemployment rates in various countries around 2010 on the Robinson map introduced as reference frame earlier (Graph 3). Other examples of cross-cultural surveys are the Eurobarometer, the World Value Survey, PISA, ISSP, ESS, LIS and EVS.

Methodologically, the only difference between these data analyses is (apart from using different data sources) *the level of aggregation of the spatial unit*. In comparison to qualitative approaches, these studies typically lack in detail but are better generalisable. Although there are many unsolved methodological problems, great progress has been made in the last two decades concerning sampling and data collection methods both concerning *cross-cultural survey methodology* (Baur 2014a, in this HSR Special Issue) and *public administrational data* (Baur 2009b).

Graph 11: Example for Comparison and Classification I: Ethnic Population in Canalport, Chicago (1928)

ECOLOGICAL MAP OF CANALPORT, 1928

Plotted on Social Research Base Map. Business centers plotted from Hart's Land Values, 1928. Types of dwellings plotted from the City Building Map.

NATIONALITY DISTRIBUTION IN CANALPORT, 1928

Plotted on Social Research Base Map. Residences and nationalities plotted from records of City Charity Association.

Source: Palmer (1928/1929), 222-7.

At the same time, there have also been advances concerning *multivariate data analysis* methods (Baur and Lamnek 2007; Fotheringham et al. 2009). *Typically, the relations within the chosen spatial unit are analysed and compared*. For example, in the first phase of analysis of the Globalife project (e.g. Blossfeld and Hofmeister 2006), each researcher used a data set from a different country (e.g. Germany, Denmark, the U.S.) and analysed which factors influence success on the labor market in that country in a specific career phase such as the mid-life career phase. As each country's labor market institutions vary, different models had to be calculated for each country. In the second phase of analysis, the results for the different countries were compared. Researchers could thus see which economic changes in the last decades affected all social groups in all countries equally and which changes only affected some countries or some social groups in some countries.

Graph 12: Example for Comparison and Classification II: Unemployment Rates in Various Countries around 2010
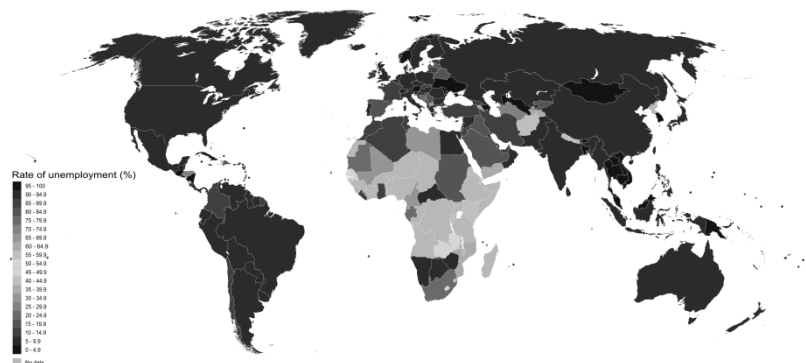
Source: Jolly Janner [Public domain], via Wikimedia Commons, <http://commons.wikimedia.org/wiki/File:World_map_of_countries_by_rate_of_unemployment.png?uselang=de>, revision on 31 December 2013. If possible, the IDU (International Definition of Unemployment) rate is used. For further details on methodology see: <http://en.wikipedia. org/wiki/List_of_countries_by_unemployment_rate>.

While these approaches (although they make use of quantitative methods) only compare the spaces (e.g. countries) themselves on a theoretical level, some analysis procedures enable researchers to *compare and classify spatial units themselves using quantitative methods* (Friedrichs 1980, 87-92), e.g. *cluster analysis* (Fromm 2010, 191-222; Waller 2009) *of aggregate data* (Graeff 2014). Examples are Esping-Andersen's (1990) classification of welfare regimes, Heidenreich's (2003) analysis of (economic) regional disparities within Europe and Baur's (2013h) study on types of economic regions within Germany.

Using the example of unemployment, Nosek and Netrdová 2014 (in this HSR Special Issue) explain the concepts of *regional variability (regional decomposition)* and *spatial autocorrelation* in order to be able to *quantify spatial aspects of variability*. They particularly focus on the differences between regional units, the distribution of phenomena in space, spatial clustering and spatial concentration. In doing so, they move forward and backwards between an absolute and relative stance towards space and between analysing social processes within a chosen spatial unit (section 6) and between spaces (section 7).

7.   Relations and Movement between Space(s)

Cluster analysis works with the concept of a given spatial unit. While it might compare these spatial units, it does not move beyond them. However, as these spatial units are socially constructed (see above), they also might be connected (Baur 2013c, 2013i). Thus, some methods – although they accept the concept

of given spatial units – analyse these relations and also the movements of people and things between spaces (Graph 13).

Graph 13: Relations and Movement between Space(s)
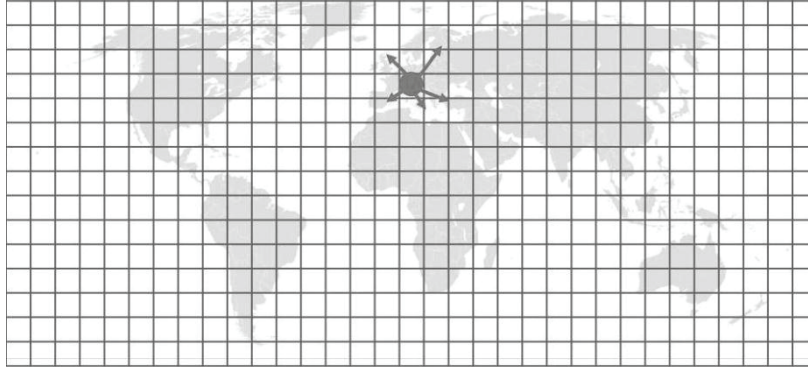
Source: Own Creation, based on map by Canuckguy et al. based on BlankMap-World6.svg [Public domain], via Wikimedia Commons <http://commons.wikimedia.org/wiki/File:BlankMap-World6,_compact.svg?uselang=de> (accessed December 14, 2007).

7.1   Qualitative Approaches and Cartographic Approaches.

Starting from the observation, that people (and things) need time to move in spaces (Baur 2013c), …

1) … both cartography and qualitative research have developed *data collection methods* (Schwesig 1988, 48-136) for *tracing people's specific space-time-paths* (Giddens 1984; Cromley 1999, 64-82, 104-16; Pohl 2010). Typically, data are either collected using standardised instruments (such as surveys) or quantified after data collection.

2) Using methods of *Social Network Analysis (SNA)* (Hannemann and Riddle 2005), these space-time-paths are typically condensed to *action spheres ("Aktionsräume")* (Heineberg 2006, 160-3; Friedrichs 1977, 302-7, 314-28). The action sphere is the area that an individual typically covers in their everyday lives by doing their everyday activities.

3) Researchers then can analyse *if a person's action sphere lies within a chosen spatial unit (e.g. the quarter, the city), or if they typically cross the borders between those units and move between them on an everyday basis* (e.g. moving from one quarter in which a respondent lives to another quarter of the city for work).

Early examples are Friedrichs' (1990) analysis of the changing range of action spheres in the life course and Heuwinkel's (1981) and Schreiner's (2000, 27-46, 75-133, 158-209, 225-34, 276-87) analysis of the action spheres of Berlin's population.

7.2 Quantitative Approaches

Quantitative approaches resemble qualitative and cartographic approaches in that they also make use of *Social Network Analysis (SNA)* (Hannemann and Riddle 2005) in order to analyse the *interconnectedness of spaces of the same aggregate level*, e.g. by movement or other links between these spaces. For example, Graph 14 shows global transport connections, namely places linked by Airbus A380 routes in 2013. As in Graph 12 , the data are projected into the reference frame (Graph 3).

Graph 14: Network Analysis (Airbus A380 Routes by Airline, 2013)

Source: Gyrostat [CC-BY-SA-3.0], via Wikimedia Commons <http://commons.wikimedia.org/wiki/File:A380_Routes.png?uselang=de> (accessed November 28, 2013).

A more complex example is given by Taylor et al. (2008) who analyse the development of the European network of science between the 16th and 20th century. They show that until the 17th century, Padua was the centre of European science, as most academics spent some part of their career in Padua, regardless where their career started and where it ended. Additionally, researchers did not move directly from one university town to another. Instead, career moves typically went via a research stay in Padua. In the 18th century, the European science system was multi-centred, with Padua, Jena, Paris, Leiden and London being centres of transmission for scientists' careers. In the 20th century, London was the centre of the British system – researchers typically moved between Oxford, Cambridge and Edinburgh, but always via London. In contrast, the rest of Europe was centred on Berlin, with no significant career move being possible without a career phase in Berlin.

   A different quantitative approach starts from the observation that space is a *multi-level phenomenon* and tries to grasp the *interconnectedness of spaces of the different aggregate levels*. The method typically used is *Hierarchical Linear Modelling (HLM)* (Friedrichs 1977, 350-61; Pötschke 2006). For example,

Lüdemann and Peter (2007) demonstrate that properties of a neighbourhood (e.g. incivilities, contacts to and trusting one's neighbors and general social capital) influence the likelihood of someone becoming a crime victim. Franzen and Meyer (2004) explicate that attitudes towards the environment not only depend on individual properties (such as income and postmaterialism) but also on the nation state an individual comes from (and especially average national income).

8.   Conclusion

We have tried to illustrate in this paper that there is already a wide range of methods for spatial analysis, although the current methodological debate lacks integration. We have argued that in order to achieve this, theoretical and methodological debates have to be integrated in parallel and linked to each other, and we have pointed to some theoretical issues that need to be addressed in order to do so.

We also suggest using a *framework of five dimensions for linking these debates:* (1) thinking and imagining space; (2) creating and changing space; (3) experiencing, appropriating and orientating within spaces; (4) (inter)action and distribution within spaces; and (5) relations and movements between spaces, although it needs to be decided in future research if this framework is sound and complete.

Additionally, we have shown how *cartographic*, *qualitative* and *quantitative methods* have so far been used in empirical studies in order to address these methods. Using this overview, one can say that *cartographic approaches* have tried to address each of these dimensions, using the *map as means for linking results* from (1) *symbolic analysis* and *cognitive/mental maps*; (2) *morphogenetic analysis*; (3) *functional analysis*; (4) *analysis of social space* ("*Sozialraumanalyse*") and *social reporting* ("*Sozialberichterstattung*"), (5) *analysis of action spheres* ("*Aktionsraumanalyse*"). These analyses typically stress the description of spatial patterns.

In contrast, *sociological analyses* typically focus on the driving actors, the reasons for and results of spatial processes. For all dimensions of analysis, *ethnography* is very often a main method, although the analytical focus may differ widely. Additionally, Sociology and other social sciences so far have made use of the *whole scope of qualitative data sources* (e.g. interviews, literature, documents, maps, newspaper articles) *and research traditions* (e.g. case studies, discourse analysis), depending on the research question. A main drawback of this entire research field is that (although there is a large body of sound empirical studies) there is hardly any methodological debate.

Quantitative approaches (especially survey methodology) so far have been used mostly for analysing (inter)action and distribution within space, and rela-

tions and movements between spaces (dimensions 4 and 5). The main drawback of this methodological discussion is that it has withdrawn itself to the field of *survey methodology* and *cross-cultural research* and does not frame itself as addressing spatial problems (although it is doing just that, as we have shown).

So far one can conclude that the methodological debate has to look both forward and backward: it has to look backward and re-read the examples of good research practice, because the lack of former methodological debate carries the danger of losing the knowledge on spatial analysis that has already been gained over the last centuries.

The debate has also to look forward to integrating the debates and thus illuminating respective blind spots. For example, HLM (a method for analysing the relations between spaces, dimension 5) starts with the assumption that each higher aggregate level can be completely divided into lower aggregate levels, e.g. that a nation consists of a specific number of regions or that a city consists of a specific number of quarters. This means that there are no unassigned spaces or blank spots on the map and there are also no spatial overlaps (e.g. there may not be a city that is part of two nations). If one takes into account the *social constructedness of space* (dimensions 1 to 3), it becomes immediately obvious that this approach is highly questionable, and there are also many empirical examples that contradict this assumption such as cities that belong to two states, e.g. Berlin between 1945 and 1989 (FRG/GDR), Lefkosia/Nicosia (Republic of Cyprus/Turkey) or Frankfurt (Oder)/Słubice (Germany/Poland).

Having identified such a blind spot, one can continue to improve spatial methods by using the advantages of modern technologies as GIS and by moving towards *interdisciplinary* and *mixed methods research*. For example, Chan-Tack 2014 (in this HSR Special Issue) stresses the importance of moving to a *relational concept of space* not only in qualitative but also in quantitative data analysis and taking the effort of gathering point-location data instead of using traditional administrational spatial units.

We believe that this special issue contains many other good examples of what future methodological research on spatial methods could look like. We also suggest that the most urgent questions concerning spatiality future methodological research should address are:

1) *Methods for creating, experiencing and appropriating space*. While there have been a lot of actual research and methodological developments on how space is imagined (dimension 1), how people interact in space (dimension 4), what relations space have to each other and how people move between spaces (dimensions 4), there is surprisingly little research on how space is created (dimension 2), experienced and appropriated (dimension 3), or – in Löw's (2001) terminology – on the practice of spacing and synthesis. Therefore, one focus for future research should be how to methodological grasp these aspects of spatiality.

2) *Linking cartographic and (both qualitative and quantitative) sociological methods* should be a second focus for future research, and there are several papers in this issue that point into this direction, e.g. Scholl et al., Thierbach and Lorenz and Chan-Tack. We particularly suggest using GIS and the map as reference frame for linking these methods.

3) *Solving the problem of borders (MAUP).* We have argued that methodology should move towards the concept of relational space. However, as we have shown, for methodology the problem is that (at the point of data collection) one has to locate data in space. This is both true for qualitative and quantitative research. However, while qualitative research can work with concepts of fuzzy borders and thus ignore this unsolved theoretical problem in research practice, quantitative researchers face the problem that most quantitative studies implicitly are based on the assumption of absolute space. More specifically, as we have shown above, most quantitative studies draw on the principle of the random sample which (at least implicitly) uses the concept of absolute space, as *sampling populations need to be defined spatially and thus need a defined border*. For some time, quantitative research has struggled with the problem that these borders are socially constructed (Baur 2014a, in this issue), and there have been different suggestions for solutions, e.g. collecting spatially sensitive data (Chan-Tack 2014, in this issue), using spatially sensitive indicators that can make do without the concept of a sampling population (Schräpler 2009, 2011) or alternating between different perspectives of analysis (Nosek and Netrdová 2014, in this issue). However, all of these concepts have their limits, if data were collected in the past or there are only relatively few data sampled for a given spatial unit, as is usually the case with classical surveys.

4) *Solving the problem of scaling.* Closely linked to the problem of borders is the problem of scaling – as space is a multi-level phenomenon, from a methodological point of view, all spatial units are aggregated from time-space-coordinates. Typically, how units are aggregated depends on historical administrational or social practices. If one wants to move away from this rather contingent way of aggregation, the question arises how units at different levels of aggregation levels can be transferred into each other. This is especially important for GIS, as geodesy would need some sort of algorithm to do this automatically, but also to ensure if and how results from different studies are comparable.

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