Chapter 1
Knowledge, Action, and Space: An Introduction

Peter Meusburger and Benno Werlen

The present epoch will perhaps be above all the epoch of space.

Michel Foucault (1984/2002, p. 229).

Open and Contested Research Questions

This book starts from the widely accepted premise that parts of knowledge can be defined as ability, aptitude, or "capacity for social action" (Stehr, 1994, p. 95)[1] and that the production and dissemination of knowledge are always embedded in specific environments (spatial context, spatial relations, and power structures). That point of departure makes it evident that the mutual relations between knowledge, action, and space are central research issues in disciplines dealing with human existence. For instance, acting under conditions of uncertainty, people must rely on experience gained in various situations and environments. To achieve their goals, they have to gather new information, acquire new knowledge, and develop new skills in order to cope with unexpected situations and unfamiliar challenges. Knowledge, experience, and information-processing are the foremost resources determining how aims of actions are set; how situations, opportunities, and risks are assessed; and how constellations, cues, and patterns are interpreted. They are the primary foundations for evaluating locations and spatial configurations, solving

[1] The close relationship between knowledge and power is evident by the very fact that they have the same etymological roots. The word *power* derives from the Latin *potere* (to be able). The Latin noun *potentia* denotes an ability, capacity, or aptitude to affect outcomes, to make something possible. It can therefore be translated as both knowledge and power (see also Avelino & Rotmans, 2009, p. 550; Meusburger, 2015c, p. 31; Moldaschl & Stehr, 2010, p. 9; Schönrich, 2005, p. 383). Most authors define action as goal-directed human activity that should be differentiated from pure behavior. Action is that part of behavior that occurs intentionally (see the Chap. 6 by Joachim Funke in this volume). Knowledge has an impact on action *and* behavior.

P. Meusburger (✉)
Department of Geography, Heidelberg University, Heidelberg, Germany
e-mail: peter.meusburger@uni-heidelberg.de

B. Werlen
Department of Geography, Friedrich Schiller University Jena, Jena, Germany

P. Meusburger et al. (eds.), *Knowledge and Action*, Knowledge and Space 9,
DOI 10.1007/978-3-319-44588-5_1

problems, and enabling individual actors and social systems to appropriate space. Knowledge, learning, and information-processing can be regarded as links between action and space or action and environment (for details see Meusburger, 2003). Conversely, the spatial dimension plays a key role in the acquisition of knowledge and the implementation of actions. Scholars broadly agree on several points:

- Commitment and willful intent alone do not guarantee goal attainment.
- Goal-setting (is a given goal desirable and feasible?) and goal-striving (how is the goal being pursued?) are affected by knowledge, skills, experience, and the search for new information.
- Experience rests upon former actions in specific settings.
- There are manifold relationships between knowledge, power, and action,
- Learning processes are embedded in, and to some extent shaped by, the social and material environment.
- Settings and locations have a fundamental significance in the search for and access to rare or valuable information, the acquisition and distribution of knowledge, and the successful implementation of actions.

However, the devil is in the details. Relationships between knowledge, action, and space are very complex, some of them are still not fully understood. Some theoretical approaches focus on very simple problems (laboratory experiments) or work with a number of black boxes or questionable premises. Studying the interrelations of knowledge and action, one is apt to raise the following questions: To what extent is knowledge a precondition for action? How much knowledge is necessary for action? To what extent do various types of knowledge influence aspirations, attention, evaluation of situations, search for alternatives, implementation of intentions, decision-making, and problem-solving? How do bidirectional connections between knowledge and action function? How do different representations of knowledge shape action? Are knowledge, skills, experience, and educational achievement useful categories or should they be replaced by broader terms such as "reflective system" or "cognitive capacities"? How rational is human behavior? What categories of rationality should be distinguished? Does irrational behavior reflect a lack of appropriate information or is it rather affected by the impulsive system and orientation knowledge? How do deliberative, rational thought and impulsive affect interact and influence action? Why do people occasionally act against their knowledge? What are the social functions of knowledge? In which way can action research profit from interventions of arts and aesthetics?

Some of the most pressing questions in the study of the interrelations of action and space are: Which concepts of space and place are appropriate for analyzing relations between knowledge, action, and space? At what level of aggregation (individual, organization, spatial units)[2] can relations between knowledge, action,

[2] A social system's ability to act competently and achieve its goals depends not only on the knowledge of individual actors but also on their integration in organizations (institutions), the way organizations process information and share knowledge, interact with external social environment, and structure the way decisions are taken.

and space be documented by which indicators and empirical methods? How much are the spatial conditions of actions exposed to historical transformation? What exactly is the role and importance of spatial representations for the construction of sociocultural realities in the past, present and future? How does the digital revolution change the historically established society–space relations? What are the spatial implications for the formation of knowledge? Is the term *environment* an abstract category, a social macrophenomenon, a local cluster of individual factors of influence, or a localized culture? How can one measure an environment's impact on action and knowledge production (Meusburger, 2015a)?

These and other questions indicate that relations between knowledge, action, and space are not as simple as some people might assume or as some decision and risk models or traditional rational choice theories suggest. The questions simultaneously underscore the urgent need to explore the interdependencies of knowledge, action, and space from different disciplinary angles, scales of analysis,[3] time dimensions,[4] and ontologies.

The main ambition of this book is to contribute to the clarification of the linkages between knowledge, action and space beyond the well-established models. To redeem this claim it is first necessary to overcome the problematic legacy of *homo oeconomicus* and traditional rational choice theories and discuss some of the reasons why the spatial dimension was neglected or played only a marginal role in action-centered social theories. If we want to deepen the insights into the relations between action, knowledge and space, then the spatial dimension needs as much theoretical inquiry as the relations between knowledge and action (see the chapters by Werlen (Chap. 2), Ernste (Chap. 3), Olsson (Chap. 4), Gardenförs (Chap. 12), and Berthoin Antal and Friedman (Chap. 13) in this volume).

The Neglected Spatial Dimension in Modern Social Theory

Until the first decade of this century, one of the key shortcomings of modern social theory was the nearly total neglect of the spatial dimension of agency (Giddens, 1984), communication, social actions (Werlen, 1993b), and social relations. Systematic social theories and action theories in particular have so far widely ignored the spatial dimension of the social. This blindness for the spatial is embedded in more general features of modern social theory that have important implications not only in the field of theory, but consequently also for current societal problem constellations.

[3] Each scale of analysis yields certain insights that other scales cannot deliver.

[4] Often the question of whether actors possess the knowledge necessary to solve a problem and of which impact on decision-making and actions is due to superior or earlier knowledge or ignorance can be answered only after events or actions have taken place and unintended consequences have surfaced. Time lags between knowledge acquisition (e.g., research) and successful action (e.g., innovations) can amount to many years or even decades.

According to Giddens (1984), one of the chief reasons for the underrepresentation of spatial issues in social theory is the overemphasis on time. Time, not space, has been pivotal for philosophy (Hegel, Bergson), the social sciences (Marx, Spencer, Durkheim), biology (Darwin), and history. Time—the sequential ordering of events—is obviously central in action theory. The implementation of action plans and intentions lies in the future, whereas the present situation of actions has resulted from actions of the past. Another notable reason that space aspects have not figured greatly in social theory is that the spatial dimension refers first to the ordering of physical objects and artifacts. It is thus allied somewhat more closely to immediate visual experience and is therefore less "abstract" than is the case with the temporal order. But the main explanation for the relative neglect of the spatial dimension pertaining to social realities in the action-centered perspective certainly stems from emphasis on the subjective meaning of action. The theory of social action as formulated by Weber (1912/1988, 1913, 1922/1980) implied that the embodied actor and the physical world were largely left out of the biologistic and functionalist tendencies in the social sciences (Werlen & Weingarten, 2003, pp. 205–207). This exclusion essentially arrested the development of concepts that could have integrated the spatial dimension and avoided the pitfall of biologistic or materialistic reductionism.

However, when the spatial dimension is taken into account, the word *space* is often not understood as a theory-dependent term but rather as a given fact. The social sciences commonly refer to notions of geographic space that are considered rather traditional or outdated in current social and cultural geography because they conceptualize space as a material object, a container, or projection plane of material and immaterial social life. Although lack of a systematic theoretical reformulation of *space* in a more sociotheoretical compatible way is detectable in the work of Pierre Bourdieu as well as in substantial parts of Giddens' (1984) theory of structuration, it is primarily found in social and cultural studies after a shift toward acceptance of the spatial dimension occurred. Exponents of this "spatial turn" claim to have overcome the spatial ignorance identified in their fields and disciplines of study. Their assertion is often unconvincing, however, because space continues to be thought of as a material object or container, with little progress toward a conception of space that is firmly grounded in social theory in a manner compatible with action.

The continuing overemphasis on the container or geographical earth-space in cultural studies and the social sciences leaves the spatial turn incomplete, inflexible, and myopic. These limitations also underlie fields of research and social policies in which it is not apparent at first glance, especially when "nature" is taken into account. An especially prominent example is the sustainability research based on the World Commission on Environment and Development (1987), known as the Brundtland report (Gäbler, 2015; Werlen, 2015), and on purportedly environmental policies derived from it. Casting the environment as a container space conceived in terms of Newton's mechanics, the recommendations for environmental policies are the product of a mechanical world view. They advertise the idea that it could suffice

to turn some screws of the world machine to, say, decrease the global temperature by 2.0° Celsius, as propagated by the COP 21.[5]

Reconceptualization of the spatial dimension is imperative in the study of the interrelation of knowledge and space. When focusing on the role of places, spaces, spatial settings, environments, milieus, and fields of communication for cognitive processes, learning, knowledge production, and action, one must be careful to use the appropriate concepts of place and space in order to avoid implicit determinism and reductionism. When the concept of space as used in the natural sciences becomes a primary category of social research, it has major and problematic implications. In keeping with Newton's theoretical construction of space as a container, the two most relevant ones are the underlying spatial determinism and the likelihood that values, norms, and other nonmaterial entities will be reduced to earth-spatially positioned material objects. The morphing from immaterial to material or physical form will certainly not improve the results of social sciences and social politics, for all it does is falsify the real nature of sociocultural realities. Social research needs to find its own conceptualization of the spatial dimension of societal realities, including the generation of knowledge (for details see Schwan, 2003; Steiner, 2003; Weichhart, 2003, pp. 19–39).

For decades, unfortunately, subject-oriented action theory neglected the link between action and space, that is, the knowledge, competence, experience, skills, and learning processes of individuals, social systems, and institutions. Vague allusions to cognitive processes and reflective systems or ascriptions of meaning and value to material objects do little to explain why actions succeed or fail, why goals are achieved or missed, why some agents are competitive and others not, or why interactions with and adaptations to the environment vary so greatly in the spatial dimension. The focus should be more on different preconditions and outcomes of cognitive processes. To what extent do different levels of knowledge, educational achievement, occupational skills, experience, and scientific and technological standards influence the results of cognitive processes—from perception and situation analysis to decision-making and acting.

Material artifacts and spatial configurations acquire a social or symbolic meaning only through symbolic appropriation, through processes of learning, evaluating, interpreting, and using them. The results of such ascriptions, evaluations, and interpretations range from knowledgeable to ignorant, depending on the degree of experience brought to these processes, and the results change over time. It is therefore crucial to take into account the social, spatial, and cultural disparities of knowledge, competence, and experience as well as the level of research and technology when analyzing relations between space and action.

Geodeterminism emerges when the learning and evaluation processes between space (as a material object) and action are skipped. For instance, a geodeterminist would argue that a mountain range is a natural border; a specific terrain or a gorge, an optimal location for a fortification. A social geographer would argue that it is not

[5] Conference of the Parties (COP 21) held in Paris, 15–16 April 2016, was part of the cycle of major UN conferences on climate change.

the terrain, gorge, or mountain pass itself that has induced people over the centuries to build one fortress after the other at the same place. It is rather the result of knowledge accumulation and experience over many generations that led to the firm conviction or knowledge that a specific place is an ideal location for a fortress given the available transportation and military technologies. As soon as hitherto existing technologies are disrupted or political territories are expanded, the situation will be evaluated differently and people will conclude that other locations are more suitable.

In human geography the adventurous sense of reconceptualizing space and spatiality suffuses the publications of Belina (2013), Gregory (1994, 1998), Harvey (2005), Lippuner (2005), Lippuner & Lossau (2004), Massey (1985, 1999a, 1999b, 2005), Paasi (1991), Schmid (2005), Soja (1985), Tuan (1977), Weichhart (1996, 1999, 2003), and Werlen (1987, 1993a, 1993b, 1995, 1997, 2010a, 2010b, 2013, 2015), to name just a few. Geographies of knowledge, education, and science (Freytag, Jahnke, & Kramer, 2015; Jöns, 2008; Livingstone, 1995, 2000, 2002, 2003; Meusburger, 1998, 2000, 2008, 2009, 2015a) and creativity studies (Amabile, Conti, Coon, Lazenby, & Herron, 1996; Amabile, Goldfarb, & Brackfield, 1990; Csikszentmihalyi, 1988, 1999; Hennessey & Amabile, 1988; Meusburger, 2009; Sternberg & Lubart, 1999) contributed to that discussion by documenting how educational achievement, occupational skills, research, and creative processes influence actions of individuals and social systems, how research and creative processes are the result of interactions between agents and their environment, and why various spatial disparities of socioeconomic structures persist for long periods.

The Problematic Legacy of Homo Oeconomicus *and Rational Choice Theories*

Taking the spatial dimension into account first requires a critical review of the classical models used in social sciences, especially the model of economic actions based on the concept of *homo oeconomicus*. The claims about its general validity and applicability are inherently linked to the alienation of space. The concept of *homo oeconomicus* and the assumptions that traditional rational choice theorists make about the human decision-maker and some other premises have been criticized by many authors as empirically unfounded and psychologically unrealistic (Buskens, 2015; Flache & Dijkstra, 2015; Gigerenzer & Gaissmaier, 2015; Green & Shapiro, 1994; Goldthorpe, 2000; Haselton et al., 2009; Hertwig & Herzog, 2009; Samuels & Stich, 2015). Theories of bounded rationality, behavioral economics, evolutionary economics, new theories of the firm, the strategic management approach, and nonrational theories have been divested of many unrealistic premises; nevertheless, some theoretical concepts of decision-making used in economics and partly also in social sciences[6] still carry the detrimental legacy of *homo oeconomicus*

[6] For an overview of the large variety of rational choice models, see Wittek, Snijders, & Nee (2013).

and traditional rational choice theories. We do not repeat here the extensive critique of that model but rather focus on those aspects for which the lack of sensitivity to the spatial dimension of human existence and sociocultural realities is playing an important role, at least from a geographer's point of view. In the geography of knowledge (Meusburger, 1998, 2015a, 2017), one critique is that many theoretical concepts of decision-making ignore—

- social and spatial disparities of knowledge;
- the impact that environments, spatial contexts, and spatial relations have on the generation and diffusion of knowledge;
- the selective mobility of different categories and levels of knowledge; and
- power structures in space. The enduring persistence of national and global urban hierarchies is due mainly to relations between knowledge and power, the spatial concentration of power, the vertical division of labor, and selected migration.

Mutual relations between knowledge and power have been intensely discussed elsewhere (Gregory, 1998; Meusburger, 1998, 2000, 2015c; Meusburger, Gregory, & Suarsana, 2015) and need not be repeated here. They are neatly summarized by Foucault (1980):

- The exercise of power perpetually creates knowledge and, conversely, knowledge constantly induces effects of power. (p. 52)
- Knowledge and power are integrated with one another, and there is no point in dreaming of a time when knowledge will cease to depend on power. (p. 52)
- It is not possible for power to be exercised without knowledge, it is impossible for knowledge not to engender power. (p. 52)

It is also criticized that some scholars do not distinguish between knowledge and information,[7] and that the costs and time needed to acquire the knowledge, expertise, and the advanced levels of educational achievement necessary to solve complex problems are neglected or underestimated.

From a geographer's point of view, the ideal-type premises of homogeneous space and ubiquity of knowledge are the most critical shortcomings, the assumptions farthest from empirically verifiable realities. Unequal spatial and social distribution of various categories of knowledge and skills can be traced to early human history, at least to the time when the first scripts were developed (5500 BC). Spatial and social inequalities of knowledge, spatial concentrations of power (Meusburger, 1998, 2000; 2008; 2015c) and hierarchically structured urban systems are a constitutive element of highly differentiated societies that are based on horizontal and vertical division of labor. In a knowledge society, the range of knowledge gaps, knowledge asymmetries, and spatial disparities of knowledge is larger than ever and is constantly growing.[8] With respect to the assumption that knowledge is spatially

[7] For detailed discussion see vol. 10 in the series on Knowledge and Space.

[8] This statement contradicts the popular view that anybody in the digital age has access to the knowledge available worldwide. The Internet offers access to information, not to knowledge. Whether available information is understood, accepted, and assimilated into a person's existing knowledge base depends on complex psychological processes (Meusburger, 2017).

ubiquitous, the rational choice model is so remote from the empirical facts that its heuristic value tends toward zero if the spatial dimension is taken seriously. The wide dissemination and use of the premise that space is homogenous certainly has to do with the exclusion of spatial and cultural constellations. Unfortunately, it has ecologically and culturally problematic consequences as well.

Even within the rules of social modeling, the rational choice model does not meet applicable standards. Models may idealize empirical reality only if their heuristic value is not undermined (see Werlen 1993a; 1993b, pp. 43–51). If the model strays too far from empirical reality, it can no longer help detect that reality's regularities or properties. "Without *knowledge*, or beliefs that correspond to reality, thinking is an empty shell" (Baron 2008, p. 15, italics in the source).

The premise that knowledge is ubiquitous is sometimes justified by the impact of the Internet. The Internet facilitates the spatial distribution of easily understandable information and routine knowledge but certainly does not have deeper balancing effects on spatial disparities when it comes to the spatial distribution of jobs that need advanced scientific, technical, and expert knowledge. Such jobs are not as mobile as some authors may assume, they tend to concentrate in certain places or areas (Malecki, 2000; Meusburger, 2000, 2017). Different categories of knowledge travel at different speeds and very selectively.[9] The individual has limited cognitive capacities and only a minute and constantly diminishing share of all knowledge worldwide (see the Chap. 7 by Stehr in this volume). Even if the individual possesses the cognitive capacities to specialize in a certain field, it takes years and incurs great cost for that person to acquire such knowledge, educational achievement, and expertise.

For decades, traditional rational choice theory and instrumental rational action models focused on a peculiarly rational and omniscient type of person who has or easily gains access to all the knowledge, skills, and expertise needed in order to make rational decisions and achieve his or her goals.[10] Most adherents of these theories have ignored or suppressed the fact that people differ in their cognitive capacities, level of knowledge, professional experience, and skills, not to mention their level of education.[11] A number of authors writing about rational choice theory

[9] Mobilities of knowledge are the topic of volume 10 in this series.

[10] "Neoclassical economics typically employs the assumption of perfect rationality…Rational actors never fail to find the action that maximizes their utility, even if this requires unlimited capacities to process and memorize all information available and to have unlimited foresight of the consequences of all available courses of actions in a distant future" (Flache & Dijkstra, 2015, p. 907). Empirical evidence shows that people have limited and unequal information-processing and computational capabilities. These findings have led to various models of bounded rationality (Simon, 1956, 1982, 1990).

[11] Professionals, scientists, engineers, and other experts must study many years to acquire the task-related or goal-relevant knowledge they need for their problem-solving and decision-making. Much of this knowledge and expertise can be learned only in specific institutions of higher education. It is therefore difficult to understand why differences in the level of educational achievement play but a marginal role in action theory and rational choice theories.

(e.g., Buskens, 2015; Radner, 2015) simply altogether avoid using categories such as knowledge, skills, expertise, and educational achievement.

Another weakness of traditional rational choice theory is the fact that rationality—conventionally understood to be a method of thinking and logical consistency—has little explanatory power. The concept of rational behavior focuses on a person's strategic choice of the best means to achieve a certain goal, but it does not include consideration of the goal's reasonableness and attainability or of the resources needed in order to pursue the goal.

> [F]ormal logic is concerned with the rules for drawing conclusions from evidence with certainty. That is, it is concerned only with inference. It says nothing about how evidence is, or should be, obtained. Formal logic, therefore, cannot be a complete theory of thinking. (Baron, 2008, p. 81)

In decision-making and goal-oriented social action, formal logic must be combined with knowledge, expertise, skills, and the newest information. Because actors differ in their levels of information, knowledge, skills, experience, and educational achievement, they arrive at very different decisions if they follow the principle of rational decision-making. What seems rational to an agent who has little expertise and relies on public information might be irrational to an actor with great expertise or to a stock broker with insider knowledge. "[A] given act may appear rational at the time it is undertaken; yet when a different goal is activated to which that act was detrimental it may appear irrational and one might come to regret it" (Kruglanski & Orehek, 2009, p. 647). High levels of knowledge, skill, expertise, and early access to important information help people come to decisions that are apt to achieve the desired goal. Gaps in expertise, skills, educational achievement, and information usually restrict goal attainment.[12]

> Like any goal-directed activity, thinking can be done well or badly. Thinking that is done well is thinking of the sort that achieves its goals. When we criticize people's thinking, we are trying to help them achieve their own goals. When we try to think well, it is because we want to achieve our goals. (Baron, 2008, p. 29)

Max Weber (1922/1980), who first made rationality a key concept in modernistic thinking, was interested in the fact that rationality created a culture of objectification (*Versachlichung*) and relegated myths, superstition, and unjustified beliefs to the background. He used the term specifically in the sense of economic rationality that denotes the strategic choice of the best means to reach a given goal. However, Weber's concept of rationality was later extended to fields where it was not appropriate. Max Weber never asserted that rationality alone will help define expedient and achievable goals, that rational agents are capable of recognizing the value and the utility of their goals, or that rational behavior will trigger creativity and innovation.

Aspects of space and spatial contexts did not play a particular role in the debates mentioned above, but they were highlighted by debates around nonrational theories. Since the late 1990s, nonrational theories, concepts of ecological rationality, geographies of science, and other fields of social geography have developed a growing sensitivity for the significance of spatial contexts, spatial relations, environments,

[12] This observation is even more relevant for social systems than for individual decision-makers.

and contact fields for learning processes, knowledge production, decision-making, and innovation. They have emphasized that learning processes are intrinsically interwoven with conceptions of space (see the Chap. 12 by Gardenförs in this volume).

Recent Developments in Decision-Making Theories and Geographies of Science: Improvements in the Understanding of Relations Between Knowledge, Action, and Space

In proposing to use theories of heuristics[13] and nonrational tools, Gigerenzer and his collaborators have introduced a concept they call *ecological rationality* (Gigerenzer & Gaissmaier, 2011; 2015; Gigerenzer & Selten, 2001; Goldstein & Gigerenzer, 2002; Samuels & Stich, 2015; Todd, Gigerenzer, & ABC Research Group, 2012). Unlike rational choice theories, heuristic theories of decision-making are concerned with psychological realism relating to the capacities and limitations of actual humans and emphasize the importance of a specific context, frame, or environment and focus on the performance of actors in the external physical and social world (Buskens, 2015, p. 903; Gigerenzer & Gaissmaier, 2015, pp. 911–912; Hertwig & Herzog, 2009; Lindenberg, 2013; Todd & Gigerenzer, 2000).

> In a world where not all risks are known and where optimization is not feasible, 'nonrational' tools such as heuristics are needed…[N]onrational theories apply to 'decision-making under uncertainty,' where not all alternatives, consequences, and probabilities are known or knowable…Rational theories, in contrast, are tailored to situations where all risks are known. (Gigerenzer & Gaissmaier, 2015, p. 911)

> The study of the ecological rationality of heuristics,[14] or strategies in general, is a framework to study performance in the external world: A heuristic is ecologically rational to the degree that it is adapted to the structure of the environment. Heuristics are 'domain-specific' rather than 'domain-general'; that is, they work in a class of environments in which they are ecologically rational. Heuristics provide not a universal rational calculus but a set of domain-specific mechanisms…, and have been referred to collectively as the 'adaptive toolbox'. (Gigerenzer & Gaissmaier, 2015, p. 912)

[13] "A heuristic is not per se rational or irrational; rather, its rationality depends on the match between the architecture of the tool and the structure of the environment in which it is employed" (Hertwig & Herzog, 2009, p. 668). "An inferential or judgmental strategy is ecologically rational if it is accurate and efficient on the sorts of tasks that were important in the environments in which we evolved" (Samuels & Stich, 2015, p. 722).

[14] "A heuristic is a strategy that ignores part of the information, with the goal of making decisions more accurately, quickly, and frugally (i.e., with fewer pieces of information) compared to more complex methods" (Gigerenzer & Gaissmaier, 2015, p. 913). "A heuristic is ecologically rational to the degree that it is adapted to the structure of the environment. Heuristics are 'domain-specific' rather than 'domain-general'; that is, they work in a class of environments in which they are ecologically rational. Heuristics provide not a universal rational calculus but a set of domain-specific mechanisms" (Gigerenzer & Gaissmaier, 2015, p. 912).

The heuristic approach to decision-making and the concept of ecological rationality are very similar to concepts used by geographies of knowledge and science (Livingstone, 1995, 2000, 2002, 2003; Meusburger, 1998, 2015a, 2015b, 2015c). They not only respect the view that human cognitive abilities are unequal because of different experience and learning processes, but—like the geography of knowledge—also take the environment's information structure and knowledge milieu into account. They accept that both the formulation of goals and the processes of information-processing, learning, research, and decision-making can be somewhat shaped by their social environment (Flache & Dijkstra, 2015, pp. 908, 911; Meusburger, 2015a).

Depending on the prior knowledge and experience of actors, a physical and social environment can play the role of an external storage space of information that may trigger associations and send cues to the informed agent. People, pictures, traces, patterns, institutions, and written sources can help overcome the limitations of human memories and cognitive capacities, including the time and effort needed to acquire specific forms of knowledge and expertise (Baron, 2008, p. 15). Structures and dynamics of environments also affect how people seek out information (Navarro, Newell, & Schulze, 2016, p. 45) and which kind of bias they must cope with in their search (Fiedler & Wänke, 2009).

Two categories—recognition-based heuristics[15] and one-clever-cue heuristics[16]—closely resemble a concept used in the geography of knowledge, prior knowledge. The term *Vorwissen* (translated in this chapter as prior knowledge) draws on the hermeneutic circle and Gadamer's (1960/1999) term *Vorverständnis* (prior understanding, pp. 250, 275).[17]

Prior knowledge accrues through learning and experience, includes intuition and latent subconscious experience, and is domain specific. Optimal search for possibilities, evidence, new goals, and "actively open-minded thinking" (Baron 2008, p. 63, italics in the original) need a superior level of prior knowledge. Prior knowledge determines whether and how available information is perceived, analyzed, and evaluated by an actor and whether it enters and broadens that person's body of knowledge.[18] Prior knowledge helps one select the most meaningful cues and has an impact on how patterns and cues are interpreted. Bushmen (San) in the

[15] The goal of recognition-based heuristics is to "make inferences about a criterion that is not directly accessible to the decision-maker, based on recognition retrieved from memory" (Gigerenzer & Gaissmaier, 2015, p. 914).

[16] One-clever-cue heuristics looks for only one 'clever' cue and bases its decision on that cue alone (Gigerenzer & Gaissmaier, 2015, p. 914).

[17] *Prior knowledge* and *prior understanding* are synonymous in the hermeneutic method. The method entails a paradox in the sense that what is to be understood somehow has to have been understood beforehand. Gadamer also calls it positive prejudgment (hence the terms *Vorwissen* and *Vorverständnis*). To have prior knowledge or prior understanding of something, one has to have already understood individual parts or aspects of it. This requisite is also called the hermeneutic circle. Philosophers preceding Gadamer also thought about this circle.

[18] The concept of prior knowledge plays an important role in the communication of various categories of knowledge (for details see Meusburger, 2017).

Kalahari are able to sleuth animals like nobody else. Experienced doctors can diagnose a disease by interpreting a few signs (students of medicine may not have this ability yet). Geographers who are specialists in a certain field of knowledge may draw path-breaking conclusions from a thematic map, whereas other persons will glean no information at all from the same map. Local people living in the Alps may have acquired enough knowledge from previous generations or from personal experience to recognize from scant, subtle indications which places may be endangered by avalanches; most tourists will not be able to evaluate these risks. Many culturally transmitted bodies of knowledge are learned through observation of[19] important environmental cues. In fact, observing and interpreting cues and spatial configurations is a long-standing heuristic device of geography.

Humans are susceptible to social influence and to the type of information that is available in their environment. Geographies of knowledge and science have illustrated how learning processes, research, and scientific careers can be influenced by the local availability of role models, resources, specific thought styles,[20] face-to-face contacts to prominent scholars, institutional logics, and organizational rules. The interrelationships of these factors and others constitute the knowledge environment of a place (for details see Meusburger, 2008, 2015a; Meusburger & Schuch, 2012). An extreme example of the impact that different informational environments have on decision-making and acting is given by Gregory (2015, pp. 113–114). Describing World War I battlefields at the western front and the differences between a *paper war* and a *trench war*,[21] he illustrates the insurmountable gulf between the experienced knowledge of the infantry in the muddy trenches of the battlefield and the abstract knowledge of the staff officers surrounding the map table in a comfortable room and planning the movements of their soldiers for the next days.

Scientific evidence from cognitive psychology (see the Chap. 6 by Funke in this volume), sociology (Stehr, 1994, 2005), social geography (Meusburger, 2015a, 2015c; Werlen, 1993b, pp. 8–11), and other research fields shows that there is no direct if–then relation between knowledge and action. There are a number of intervening variables—many of them related to the environment or place of action—that may modify, weaken, or strengthen the relations between knowledge and action. The concurrence and coaction of these variables at a certain place or in a specific area build a spatial context, social environment, or knowledge milieu that may affect decision-making and action. As pointed out by Fiedler and Wänke (2009, p. 699), properties of the environment can constrain or enhance the input to cognitive processes. These two researchers illustrate that error and bias may often originate in the information environment, in selective accessibility to information; that observations

[19] Learning by observing "includes all cases in which we learn about our environment from observation alone, without intentional experimentation" (Baron, 2008, p. 14).

[20] "The greater the difference between two thought styles, the more inhibited will be the communication of ideas" (Fleck, 1935/1979, p. 109).

[21] "Trench war is an environment that can never be known abstractly or from the outside. Onlookers could never understand a reality that must be crawled through and lived in. This life, in turn, equips the inhabitant with a knowledge that is difficult to generalize or explain" (Leed, 1981, p. 79).

can be influenced by environmental sampling; and that agents—in their capacity as available sources of information—may lack first-hand experience, overdo some risks, and neglect others. In brief, "cognitive processes are fed with an environmental input that is itself often biased and highly selective" (p. 700).

Talent, motivation, and wealth of ideas are not the only characteristics determining how successfully a scholar's research and academic career develops (Meusburger, 2015a). What we academics call creative is never the result of individual action alone. Learning processes and actions are situated in environments, organizational structures, and spatial relations. We cannot study scientific creativity by isolating scholars and their works from the social and historical milieu in which their actions are carried out. The key issue is the interaction with the environment. It is well known from creativity studies that a stimulating environment and a talented individual must come together and interact before a creative process can occur (for details see Amabile et al., 1990, 1996; Csikszentmihalyi, 1988, 1999; Hennessey & Amabile, 1988; Meusburger, 2009; Sternberg & Lubart, 1999).

An environment's impacts on action must not be regarded deterministically. An environment should not be thought of as an independent variable that directly influences all relevant actors through a direct cause-and-effect relation (if A, then B). It depends on processes of evaluation based on learning, knowledge, and experience whether spatial structures, physical space, or social environments have an impact on human action.

> A knowledge environment is a locally available potential or a local range of resources. It stands for incentives, challenges, stimulations, opportunities, and support networks that can be used, overlooked, or ignored. A knowledge environment can operate as it should only if the actors involved use the local resources and interact with each other. The outcomes of human interactions and experiences in life are always indeterminate. No one can predict the results of appropriation and interaction, whether and how often the local potential for integrating diverse viewpoints and knowledge bases will be activated, and how the relationships between creative agents will develop. Therefore, a knowledge environment's significance and effect can be analyzed only after events have taken place, after the scientific careers and research results associated with that environment have become evident. (Meusburger, 2015a, pp. 266–267)

Collective Action

Organizations, institutions, and other power structures are an environment's most efficient elements for enhancing or impeding the conversion of a person's knowledge into action. Without the support of institutions, most decision-makers cannot reach their goals (Meusburger, 1999, 2015a; Werlen, 1995, pp. 40–49). When studying the relations of knowledge and action in social systems, organizations, or institutions, one must take additional aspects into account (some of them are discussed in the Chap. 11 by Reitz; others, in volumes 6 and 7 of this series). As Goldman (2004) states, epistemic organizations need nodal points where information converges and theoretical conclusions are arrived at. But any organization has at least

two problems to cope with. First, the knowledge and experience necessary for solving a problem or making the right decisions to achieve a certain goal may be available somewhere in an organization, but it may not reach the people authorized to act on it. Second, the nodal points or authorized decision-makers may not have the prior knowledge, experience, and intuition necessary to understand and evaluate the importance of information that has been forwarded to them. Those who decide often not understand those who know. And those who know are often experts in narrow domains only or are not close to those in power.

Weber's (1922/1980) ideal bureaucracy rested on the principles of meritocracy and the absence of nepotism and incompetence. In that system the hierarchy of decision-making corresponded to a hierarchy of competence. High-ranking decision-makers were expected to have broader expertise and more experience than their subordinates; the superiors would at least be able to understand, evaluate, and embrace the information forwarded to them. In large and complex organizations, it happens quite frequently that line managers (immediate superiors) have achieved their position because of merits other than broad knowledge and expertise in a certain domain. In some political systems, ideological reliability and loyalty to a political party, ethnic group, or powerful network counts for more than expertise does when it comes to promotion to a high post. Even if managers understand the relevance and urgency of information, they may fail to draw the necessary practical consequences because they are indebted to a political party or a powerful person or are under pressure from their social environment.

Organization theory, especially the research field following the tradition of Mintzberg (1979), and the geography of knowledge have an abiding interest in the organization and coordination of social systems in space and in the spatial concentration of jobs involving high levels of educational achievement and decision-making. Originally, region meant a space that was organized, coordinated, controlled, and influenced by a power center or a social system's authority (for details see Berthoin Antal, Meusburger, & Suarsana, 2014; Gottmann, 1980; Meusburger et al., 2015). Organization theory and the geography of knowledge have documented how the structure of a social system—the centralization or decentralization of decision-making authority, skills, and competence within an organization—varies with the complexity of its tasks and the uncertainty of its environment. In summary, a number of research fields have underlined the importance of an environment or spatial context and its possible impact on individual and collective action, but their strands of argumentation have seldom coalesced.

Aims, Claims, and Content of this Volume

A main intention of this volume is to raise awareness of important research issues that various disciplines have brought into the field of knowledge, action, and space to define research gaps and misunderstandings and, if possible, to build bridges

between diverse theoretical approaches. For this purpose we editors have selected a broad range of topics and various scales of analysis. More than a dozen disciplines do research on knowledge, learning, education, innovation, and creativity. Even a glance at the definitions and concepts of knowledge used in different disciplines[22] documents the necessity of looking beyond the fence of one's own subject and avoiding monodisciplinary lists of references. Even if some of the approaches initially seem mutually incompatible, a synopsis of the relevant research from a variety disciplines can help improve the understanding of the links between knowledge, action, and space and can prompt new research questions.

This volume brings together a broad range of theoretical approaches delving into knowledge, action, and space from different angles. Some of the contributors discuss knowledge as a social construct based on collective action, on socially embedded and guiding social action. Others look at knowledge as an individual capacity to act. The breadth of studies ranges from the role of knowledge in individual action to its role in collective action, from knowledge and action in the hunter–gatherer society to knowledge production in financial capitalism. The discussion of concepts and theories of knowledge touches on topics such as semantic knowledge and its organization into domains, asymmetrical knowledge and the polarization of knowledge and nonknowledge, knowledge and collective action,[23] situated problem-solving, spatial dispersion of knowledge, knowledge and planning, and expertise as a link between knowledge and practical action.

In the chapter following this introduction, Benno Werlen describes the long path geographers had to follow before they arrived at concepts of space suitable for issues of social geography. Until the late 1990s, the theoretical concepts in many fields of human geography diverted attention from the key role that the social dimension plays in the construction of meaningful geographical realities.[24]

Werlen identifies the reasons for the current failure of the spatial turn in the social sciences and offers an action-centered approach to developing a constructivist geography for the digital age. His contribution includes a specific, action-related, and action-compatible theory of space that can also take account of different concepts of space for different types of action. In this conceptualization of space, the spatial dimension of action and society is related to the corporeality of the actors and to the necessity of overcoming distances between actors and the physical elements of situations and means of action. Because the actor's body is simultaneously

[22] For an overview of different concepts and definitions of knowledge, see Abel (2008), Meusburger (2015c), Stehr (1994, 2005), Stehr and Meja (2005), and Reitz (Chap. 11 in this volume). Reitz distinguishes between knowledge as a systematic set of applicable recipes, knowledge as an organized body of theoretical statements, and knowledge as a developed capacity for situated problem-solving.

[23] The role of knowledge in organizations was the focus of volume 6 in this series (Berthoin Antal et al., 2014) and will be discussed in volumes 11 and 13 as well.

[24] The hitherto most convincing theoretical way to integrate the spatial dimension into the field of action research is also the narrowest and is of only limited use in social and cultural studies—that is, embedding metric space in locational decision-making theory applied to action models based on rational choice.

the key criterion for distinguishing between direct and mediated experiences and between face-to-face and mediated communication, the three main foci of this book—action, knowledge, and space—are conceptualized in a new framework, the socially constructed relations of space.

The geographer Huib Ernste illustrates in his chapter that the divorce of rationality and reason during the philosophical development of modernity led to recognition of different types of rationality, each with its own logics of deliberation and argumentation. Poststructuralists emphasize that each rationality contains multiple paradigms, each establishing its own set of principles, institutions, and lines of conflict that need to be taken into account. He demonstrates how these views are intricately involved in late-modern geographical theories of action and in language-pragmatic approaches[25] in geography.

Proponents of poststructuralist approaches emphasize the structural aspects of discourse, especially power structures. Laclau and Mouffe (1985), by contrast, try to retain and restore the possibility of deliberative interventions in these discursive structures by inverting Foucault's power/knowledge equation. Ernste explores the extent to which this inversion reinstates responsible and rational spatial decisions and actions as a focus of research in human geography. In his view rationality could be reconstituted as a culturally contingent phenomenon, and critical geographical analysis could again contribute to concrete problem-solving, albeit in a culturally much more informed and embedded way than hitherto. Ernste also discusses geographical action theory as put forward by Werlen (1987, 1993a, 1993b, 1995, 1997, 2010a, 2010b, 2013, 2015; see also Werlen's Chap. 2 in this volume) in the phenomenological tradition of Schütz (1932). According to that school of thought, the internal mental intentionality directed to outer objects is what ascribes meanings to these objects, as people do through their everyday place-making and everyday spatially differentiated actions. Ernste interprets this geographic action theory as the subjectivist version of what Schatzki, Knorr-Cetina, and Savigny (2001) and Reckwitz (2002) designated as the mentalist paradigm in social theory. This approach contrasts with the objectivist version of mentalism, which stems from classical structuralism.

Ernste shows that the advent of poststructuralist thinking ushered in a great reluctance to conceptualize human behavior as conscious rational actions and that the term *action* is generally avoided in most poststructuralist literature. Talking about practice instead of action indeed amounts to a novel picture of human agency and rationality (Reckwitz, 2008, p. 98). In contrast to Benno Werlen, with his subjective, meaning-oriented approach to geographical action theory, and unlike Zierhofer (2002), who advocated the language-pragmatic approach in geography, poststructuralist thinkers do not tend to place structures inside the mind or in pragmatic procedures of interaction but rather "outside" both—in chains of signs, in symbols, discourse, or text.

[25] Pragmatics is "a branch of linguistics dealing with language in its situational context, including the knowledge and beliefs of the speaker and the relationship and interaction between speaker and listener" ("Pragmatics," 2010).

Ideologies of urban and regional planning have a powerful effect on human actions. But to what extent can social behavior be influenced or even determined by planning concepts? How can one explain the gap between intention and behavior? The geographer Gunnar Olsson describes the ideology of social engineering that predominated in Sweden in the 1950s and early 1960s, principles intended to forge a happy marriage between scientific knowledge and political action. As the affinities between totalitarian thinking and social engineering are impossible to deny, Olsson starts his narrative with the role that central place theory and location theory played in Nazi Germany. Christaller (1933) and Lösch (1943/1954) were seeking a scientific method to colonize or settle a given area, especially how a set of hierarchically nested and hexagonally distributed centers *should* be tied together into a functional whole.

In the thought style of location theory, regional science, positivist thinking, spatial models, and social engineering, it is necessary to describe the functioning of society by mathematical calculations. In the 1950s and 1960s politically anchored experts took it as their mission to turn Sweden into a People's Home, a state of rationality in which the maximizing principles of utilitarian ethics were institutionalized. Their intention was to capture the power of social relations in a net of scientific laws (e.g., the social gravity model) and to acquire the means for understanding the world and for changing it as well. The history of the social gravity model in regional science and of quantitative geography provides an excellent example of the ups and downs of theoretical concepts. At first the model was treated as a formulation of great explanatory power; subsequent generations have come to see it as an expression of autocorrelation. To demonstrate power-and-knowledge relations in the form of a self-referential presentation, Olsson discusses the sculpture *Mappa Mundi Universalis*, conceived and designed by himself and Ole Michael Jensen and exhibited in the Museum Gustavianum in Uppsala, Sweden.

A Marxist view on relations between knowledge, action, and space is presented by the geographer Richard Peet. Viewing knowledge production from a global scale, he analyzes the role of expertise[26] in financial institutions, which are now the dominant economic institutions in capitalist societies. Following Marx and Gramsci, he states that knowledge production serves a class interest and that class forces lead, direct, and control the production of knowledge. What matters in the making of history are the broad social and cultural trends in thought, imagination, and comprehension, such as political-economic-cultural ideas.

He calls the production of sophisticated, but inimical, knowledge in the financial system perverse expertise. In this expertise some of the world's finest minds, such as professional economists, do the intellectual and practical modeling and are well paid and respected for doing so. But they accumulate knowledge in order to continue augmenting the incomes of already wealthy people, the capitalist class. In Peet's view, critical mass reaction to financial crisis or the pending world environmental catastrophe is prevented by hegemonic control over imaginaries by a combi-

[26] Peet (Chap. 5) defines expertise as high-quality, specialized, theoretical, and practical knowledge and regards it as the junction of knowledge and action.

nation of perverse expertise and mass social unconsciousness. The elites practice perverse expertise, and the masses lose their capacity to think rationally and respond unconsciously. Peet's conclusion is that the intersecting economic and environmental crises will continue *ad infinitum* because the existing hegemonic knowledge cannot guide effective social action. Although investor confidence is presented by the business media as a neutral, technical, and necessary factor—in everyone's best long-term interest—it is actually a committed, financial capitalist interest based on utterly biased knowledge. An instructive example is the global bond market. The interest paid on sovereign bonds is determined by the risk of default, with experts employing formulae stemming from long experience measured statistically—apparently scientific and necessary. Yet it is actually a few thousand experts representing the interests of accumulated capital who tell governments how to run their economies.

The next seven chapters focus on the microscale of analysis and discuss concepts, definitions, and research results from philosophy, psychology, and sociology. Psychologist Joachim Funke starts his contribution with three questions: How much knowledge is necessary for action? Is action possible without knowledge? Why do people sometimes act against their knowledge? He discusses some of the standard views on the relation between knowledge and action, specifically, the theory of planned behavior, the theory of unconscious thought, and the option-generation framework. He illustrates the delicate relation between knowledge and action with an example from problem-solving research. In Funke's understanding, problem-solving means the intentional generation of knowledge for action instead of simple trial-and-error behavior. His studies on the MicroDYN approach, which was used in the 2012 cycle of the worldwide PISA study, demonstrate the existence of a clear connection between the generation of knowledge and action (i.e., application of that knowledge). From the angle of a problem-solving approach, the connection between knowledge and action is a classical means–end relation. It is not possible to act *without* knowledge, but people can act *against* their knowledge.

Nico Stehr, a sociologist of science, offers a sociological critique of the prevalent argument that the increasing polarization of knowledge and nonknowledge (or ignorance) has become a distinguishing feature of modernity. He acknowledges that significant asymmetries of knowledge exist and that knowledge gaps are growing, but he rejects the interpretation that nonknowledge is the opposite of knowledge. Seeking to avoid that either–or polarity as an arbitrary, theoretically and empirically unproductive antithesis, he posits knowledge instead as a context-dependent anthropological constant representing a continuum. In his view there is only less or more knowledge, and there are only those who know something and those who know something else. The practical problem is always to know how much or how little one knows in a given situation. From his perspective the key sociological question is how to address the issue of knowledge asymmetry and knowledge gaps in various spheres of modern society, such as the economy, politics, the life world, and governance. He argues that nonknowledge has, in different societal institutions, its own functional meaning. There are myriad convincing references to the virtues and

advantages of ignorance, a lack or asymmetry of knowledge, and nontransparent situations.

The psychologists Ralph Hertwig and Renato Frey address the question of how different representations of knowledge shape human actions. Before choosing to act, people often try to acquire knowledge about a given situation, opportunities and risks, and possible consequences of their actions. In some cases they can draw on convenient descriptions of actions and their consequences—such as a medicine's accompanying information on possible side effects and their probabilities. People thereby make decisions from description. In everyday life, however, there are usually no actuarial tables of risks to consult. Instead, people make such decisions in the twilight of their sampled—and often limited—experience.

Recent research in psychology has demonstrated that decisions from description and decisions from experience can lead to substantially different choices, especially where rare events are involved. Studies on modern behavioral decision-making have commonly focused on decisions from description. The observations stemming from this research suggest that humans overestimate and overrate rare events. To improve the understanding of how people make decisions with incomplete and uncertain information and how people respond to rare events that have severe consequences, Hertwig and Frey recommend study of the psychology and rationality of people's decisions from experience. They find that people relying on knowledge from experience behave as though rare events are attributed less impact than they deserve, relative to their objective probabilities. These two researchers review the literature on this gap between description and experience and consider its potential causes and explanations, arguing that research on description-based behavior should not be played off against research on experience-based behavior, that the contrast between the two types is enlightening. These observations are not contradictory; they describe how the mind functions in two different informational environments.

In recent years many psychologists have proposed that action (social behavior) is affected by two interacting systems—the reflective system and the impulsive system—that are operating according to different principles (for an overview of the literature, see Smith & DeCoster, 2000; Strack & Deutsch, 2004, 2007). "The reflective system generates behavioral decisions that are based on knowledge about facts and values, whereas the impulsive system elicits behavior through associative links and motivational orientations" (Strack & Deutsch, 2004, p. 220). The psychologists Anand Krishna and Fritz Strack focus in their chapter on the striking duality of (a) actions planned with reflective, deliberate thought and (b) actions caused by spontaneous impulses. First separately evaluating the characteristics of reflective and impulsive styles of thinking, Krishna and Strack find that the reflective system operates according to propositional principles; it is flexible, it requires effort and motivation, and its operation is typically conscious. The impulsive system operates according to associative principles; it is inflexible, effortless, always active, and capable of operating unconsciously.

Building on existing theories of rational thought as well as impulse, impulse control, and implicit attitudes, the authors propose an integrative model of thinking and action—the reflective-impulsive model (RIM)—to show when which system of

thought will be active and under what circumstances they will influence behavior. The rational and rule-based reflective system is slow and driven by working memory capacities and arousal, which set limits for its ability to process information. The impulsive system can be thought of as long-term memory and therefore has functionally unlimited capacity.

In their RIM model Krishna and Strack describe how the reflective and impulsive systems interact during the process of thought. When the reflective system operates, it operates in parallel with the impulsive system, not in place of it. When a reflective operation begins, perceptual input has already activated several associative elements. The purpose of the RIM is to provide an answer to the central question of how the two mental processes are linked to behavior and especially how they interact through behavioral schemata.

The psychologists Frank Wieber and Peter M. Gollwitzer examine the role that spontaneous and strategic planning have in turning an individual's knowledge into action. They point out that knowing which goal one intends to pursue and committing oneself to that goal are only the first step toward successful goal attainment. Planning when, where, and how to act with implementation intentions[27] has proven to be an effective self-regulation strategy for reducing the intention–behavior gap. The authors introduce specific if–then plans for when, where, and how to act, and they discuss how such implementation intentions support goal attainment.

They highlight the importance that the accessibility of goal-relevant knowledge has for spontaneously formed implementation intentions. As for *strategically* formed implementation intentions, they point to the importance of systematically selecting goal-relevant knowledge and translating it into implementation intentions by using the self-regulation strategy called Mental Contrasting with Implementation Intentions. The authors discuss the interplay of automatic and reflective processes and suggest that strategically planning the automatic activation of goal-relevant knowledge can support reflective decision-making and goal-directed actions through use of context-sensitive reminders. Goal systems are introduced as a conceptual framework because they address the question of how goals can increase the accessibility of knowledge about when, where, and how to pursue the goal.

The authors discuss a recent experimental study suggesting that such strategic planning is very useful in unstructured situational contexts that require identification and selection of appropriate goal-relevant knowledge. They further suggest that strategic planning is less useful in structured situational contexts that prompt goal-directed actions without requiring any knowledge about advantageous opportunities to act and about potential obstacles. One of their main findings is that combining mental contrasting and implementation intentions in order to extend planning has proven more effective than either mental contrasting or implementation intentions alone.

Two chapters present a philosophical perspective on knowledge and action. Philosopher Tilman Reitz gives an overview of the broad range of philosophical

[27] Implementation intentions refer to specific plans in which individuals and groups can, by using an if–then format, specify when, where, and how they intend to act.

positions on the essence of knowledge. He argues that the social sciences largely lack a well-considered definition of knowledge, whereas philosophical debates about such a definition usually fail to include discussion of the social constitution of knowledge. In his view both approaches have overlooked or repressed a theoretical challenge: the spatial dispersion of social knowledge. He presents a concept of knowledge that is both philosophically transparent and empirically helpful for understanding basic structures of the knowledge society. Following a pragmatic epistemology, he is interested in the question of which understanding of knowledge makes sense in what kind of everyday circumstances. In his view the nature of knowledge also depends on its social organization. Do people talk about the knowledge of individuals, of collectives, or rather of knowledge incorporated in a set of rules? He is interested in changes in the organization and dispersion of epistemic practices and in delocalized and resituated knowledge in the digital information age, when new information technologies will have huge practical and epistemic effects. Encoded information or data can be automatically processed without the intervention of human agents. Stock market programs buy and sell shares, police software identifies dangerous persons, and semantic tools browse scientific data bases. Such operations involve neither beliefs nor truth and justification; no emotion, prejudice, or thought style interferes with them. But they trigger a number of new problems and new research questions.

The philosopher Peter Gardenförs, in support of his central hypothesis that semantic knowledge is organized into domains, presents a model of domain-oriented language acquisition. He defines a domain as a set of integral dimensions separable from all other dimensions. *Basic domains* are cognitively irreducible representational spaces or fields of conceptual potential. The author proposes conceptual spaces as appropriate tools for modeling the semantics of natural language. A conceptual space is defined by a number of perception-based quality dimensions that represent perceived similarity.

He offers linguistic evidence for the hypothesis that it becomes easier to learn new words within in a domain once it has been established. During the first formative years of life, a child acquires semantic knowledge prior to syntactic knowledge. Once the child has learned a word designating a color, for instance, other color words will be learned soon after. It is easier to explain to a 4-year-old the meaning of the color term *mauve* than to explain abstract monetary terms like *inflation* that are not yet within the child's semantic reach. The author explains why grasping a new domain is a cognitively much more difficult step than adding new terms to an already established domain.

A central hypothesis of Gardenförs's chapter is that many of these domains are closely connected to the development of intersubjectivity. The author defines intersubjectivity as "the sharing and representing of others' mentality." If somebody shares the emotions, attention, desires, intentions, beliefs, and knowledge of others, the exchange of knowledge is relatively unproblematic.

Ariane Berthoin Antal and Victor Friedman—both experts on organizational learning with an interest in artistic intervention—investigate the relationship between physical space and processes of creative thinking and action. They point

out that the importance of bodily ways of knowing has long been obvious to artists and neuroscientists but that organizational researchers misplaced corporeality for many years and have only recently begun to retrieve it by drawing on notions of aesthetics. The aesthetic approach to studying human behavior can reveal the roles the body plays in reading a context. The authors argue that connecting aesthetic approaches to the analysis of the construction of social space enriches the understanding of the relational processes of generating shared meaning and agreeing on how to behave in the current situation. They stress that people use all their senses to seek cues to make sense of and orient their behavior and that the body thereby also participates in deciding and signaling to others which rules of the game to adopt for the situation at hand (Edenius & Yakhlef, 2007).

This study was set in a region characterized by chronic socioeconomic underdevelopment and deep intergroup divisions, especially between Jews and Palestinian Arabs. Berthoin Antal and Friedman were interested in promoting a process in which people could (a) bring up problems, ideas, and visions, (b) meet others with whom to learn and to collaborate on issues of common concern, (c) work together to create innovative, viable projects and enterprises to meet human and economic needs, and (d) create and enact shared visions of regional development that promotes inclusiveness and interdependence rather than competition and divisiveness. In a series of videorecorded action experiments[28] conducted in a fine-arts studio, the two researchers asked the participants to think about how they would use the space of the studio to combine processes of social entrepreneurship, conflict engagement, and the arts in ways that would connect the college with the community and contribute to regional development.

The analysis of the video recordings illustrates how physical space becomes a part of social space by entering human perception and then being acted upon and shaped by people. The authors identified seven distinct configurations[29] of social space that changed over time as the participants engaged in the task. One of the striking outcomes of their video analysis was that commonalities existed across the sessions in terms of the knowledge-production processes. The fundamental structural similarity of the configurations allows the authors to formulate key insights into the relationships between space, action, and knowledge generation. The study confirms the value of separating visual from verbal analysis.

The final two chapters investigate knowledge (cognitive capacities, rationality) and mobility in space. Thomas Widlok—a social anthropologist—studies the relationship between rationality and action in a hunter–gatherer society. The prime cognitive challenge in this context is human practical reasoning about movement: the

[28] By the term *action experiments* they mean having participants develop and actively try out ideas together in a given space, recording the process, then analyzing it as a basis for ensuing steps.

[29] They use the term *configuration* in four senses: (a) the participants' positions in the room and relative to each other during a specific period of time, (b) the observable interactions of the participants among each other and with materials in the room, (c) the observable application of behavioral rules, and (d) the creation of shared meaning (to the extent it can be inferred from the group's observable behavior and outputs). The seven configurations they identified were Orientation, Meeting Mode, Expansion, Creation, Reflection, Exhibition, and Rehearsal.

decision to go or to stay. Based on ethnographic work with various groups of mobile hunters and gatherers in southern Africa and Australia, the chapter presents an investigation of rationality and action from the standpoint of human mobility in space. It begins with a critical assessment of probabilistic rational choice models of mobility and decision-making and suggests that more promising approaches are informed by work on the pragmatics of dialogues and on abductive reasoning. Rationality in that view is no longer a purely mental phenomenon, for it is distributed across social practice and is partially contained in features of the environment that western philosophy has long dismissed as irrelevant for understanding human rationality.

The psychologists Heidrun Mollenkopf, Annette Hieber, and Hans-Werner Wahl document that relations between intention and action (mobility in space) are not immutable in the course of a person's life cycle. Age, mental and physical handicaps, personal resources, environmental conditions, and other factors can separate actions from intentions. The authors study this issue by interviewing older adults about their out-of-home mobility three times over 10 years. They analyze the subjective meaning of mobility over time; perceived changes in mobility and perceived reasons for such change; the course of satisfaction in various mobility domains and with life in general; and interindividual variation. Perceived changes point to experiences of major loss in the array of mobility and decreasing satisfaction with mobility possibilities, out-of-home leisure activities, and travel. At the same time, the authors find that satisfaction with public transport is increasing among older adults. The findings of this study confirm that out-of-home mobility remains of utmost importance when people move from late midlife into old age.

Conclusion

The chapters in this volume illustrate the enormous breadth of the implications that the spatial dimension has for action, the production and dissemination of knowledge, the application and understanding of knowledge, and the generation of sociocultural and economic realities. They also reveal the large number of open or contested research questions to be answered by future research. For obvious reasons, action theory figures prominently in our introduction, but the work presented in the following pages indicates how many more theoretical concepts of various disciplines could contribute to improve the understanding of the relations between knowledge and space on various scales of analysis.

From a geographical point of view, certain key questions are not discussed in this volume: How are epistemic authority and competencies construed and evaluated in nonwestern or acephalous societies in which individuality and rationality are secondary to collective values? In which way will new digital technologies change the organization and coordination of decision-making in complex organizations? To what extent will new digital technologies change communication, interaction, supervision, knowledge storage, and social-spatial relations? Will these changes

mainly support and strengthen existing power structures or alter them substantially?

Taking into account how deeply rooted the spatial dimension is in human existence with its manifold facets, we can imagine how deep the social changes will be upon implementation of changes in social-spatial relations through digitalization and with the subsequent changes in the form of communication, interaction, and knowledge storage. It is therefore vitally important to include space in social theory in general and in action theory in particular. It looks as though Foucault's (1984/2002) prediction quoted at the outset of this introduction is likely to be confirmed, possibly even beyond the issues he raised.

References

Abel, G. (2008). Forms of knowledge: Problems, projects, perspectives. In P. Meusburger, M. Welker, & E. Wunder (Eds.), *Clashes of knowledge: Orthodoxies and heterodoxies in science and religion* (pp. 11–33). Knowledge and Space: Vol. 1. Dordrecht: Springer. doi:10.1007/978-1-4020-5555-3_1

Amabile, T. M., Conti, R., Coon, H., Lazenby, J., & Herron, M. (1996). Assessing the work environment for creativity. *The Academy of Management Journal, 39,* 1154–1184. doi:10.2307/256995

Amabile, T. M., Goldfarb, P., & Brackfield, S. (1990). Social influences on creativity: Evaluation, co-action, and surveillance. *Creativity Research Journal, 3,* 6–21.

Avelino, F., & Rotmans, J. (2009). Power in transition: An interdisciplinary framework to study power in relation to structural change. *European Journal of Social Theory, 12,* 543–569. doi:10.1177/1368431009349830

Baron, J. (2008). *Thinking and deciding* (4th ed.). Cambridge: Cambridge University Press.

Belina, B. (2013). *Raum. Zu den Grundlagen eines historisch-geographischen Materialismus* [Space: On the foundations of historical-geographical materialism]. Münster: Westfälisches Dampfboot.

Berthoin Antal, A., Meusburger, P., & Suarsana, L. (Eds.). (2014). *Learning organizations: Extending the field*. Knowledge and Space: Vol. 6. Dordrecht: Springer. doi:10.1007/978-94-007-7220-5

Buskens, V. (2015). Rational choice theory in sociology. In D. Wright (Editor-in-chief), *International encyclopedia of the social & behavioral sciences* (2nd ed., Vol. 19, pp. 901–906). Oxford: Elsevier. http://dx.doi.org/10.1016/B978-0-08-097086-8.32177-8

Christaller, W. (1933). *Die zentralen Orte in Süddeutschland. Eine ökonomisch-geographische Untersuchung über die Gesetzmäßigkeit der Verbreitung und Entwicklung der Siedlungen mit städtischer Funktion* [Central places in southern Germany: An economic-geographical study of the inherent laws of the distribution and development of settlements with urban function]. Jena: Gustav Fischer.

Csikszentmihalyi, M. (1988). Society, culture, and person: A systems view of creativity. In R. J. Sternberg (Ed.), *The nature of creativity* (pp. 325–339). Cambridge, MA: Cambridge University Press.

Csikszentmihalyi, M. (1999). Implications of a systems perspective for the study of creativity. In R. J. Sternberg (Ed.), *Handbook of creativity* (pp. 313–335). New York: Cambridge University Press.

Edenius, M., & Yakhlef, A. (2007). Space, vision and organizational learning: The interplay of incorporating and inscribing practices. *Management Learning, 38,* 193–210. doi:10.1177/1350507607075775

Fiedler, K., & Wänke, M. (2009). The cognitive-ecological approach to rationality in social psychology. *Social Cognition, 27,* 699–732.

Flache, A., & Dijkstra, J. (2015). Rationality in society. In D. Wright (Editor-in-chief), *International encyclopedia of the social & behavioral sciences* (2nd ed., Vol. 19, pp. 907–912). Oxford: Elsevier. http://dx.doi.org/10.1016/B978-0-08-097086-8.32124-9

Fleck, L. (1979). *Genesis and development of a scientific fact* (T. J. Trenn & R. K. Merton, Eds.; F. Bradley & T. J. Trenn, Trans. ; with a Foreword by T. S. Kuhn). Chicago: University of Chicago Press. (Original work published in 1935). Retrieved from http://www.evolocus.com/Textbooks/Fleck1979.pdf

Foucault, M. (1980). *Power/Knowledge: Selected interviews & other writings, 1972–1977* (C. Gordon, Ed.; C. Gordon, L. Marschall, J. Mepham, & K. Soper, Trans.). New York: Pantheon Books.

Foucault, M. (2002). Of other spaces (J. Miskowiec, Trans.). In N. Mirzoeff (Ed.), *The visual culture reader* (2nd ed., pp. 229–236). London: Routledge. (Original work published 1984)

Freytag, T., Jahnke, H., & Kramer, C. (2015). *Bildungsgeographie* [Geography of education]. Darmstadt: Wissenschaftliche Buchgesellschaft.

Gadamer, H.-G. (1999). *Truth and method* (2nd rev. ed.) (J. Weinsheimer & D. G. Marshall, Trans.). New York: Continuum. (Original work published in 1960)

Gäbler, K. (2015). *Gesellschaftlicher Klimawandel. Eine Sozialgeographie der ökologischen Transformation* [Societal climate change: A social geography of ecological transformation]. Sozialgeographische Bibliothek: Vol. 17. Stuttgart: Franz Steiner.

Giddens, A. (1984). *The constitution of society: Outline of the theory of structuration*. Cambridge: Polity Press.

Gigerenzer, G., & Gaissmaier, W. (2011). Heuristic decision making. *Annual Review of Psychology, 62,* 451–482. doi:10.1146/annurev-psych-120709-145346

Gigerenzer, G., & Gaissmaier, W. (2015). Decision making: Nonrational theories. In D. Wright (Editor-in-chief), *International encyclopedia of the social & behavioral sciences* (2nd ed., Vol. 5, pp. 911–916). Oxford: Elsevier. http://dx.doi.org/10.1016/B978-0-08-097086-8.26017-0

Gigerenzer, G., & Selten, R. (Eds.). (2001). *Bounded rationality: The adaptive toolbox*. Cambridge, MA: MIT Press.

Goldman, A. (2004). Group knowledge vs. group rationality: Two approaches to social epistemology. *Episteme: A Journal of Social Epistemology, 1,* 11–22. doi:http://dx.doi.org/10.3366/epi.2004.1.1.11

Goldstein, D. G., & Gigerenzer, G. (2002). Models of ecological rationality: The recognition heuristic. *Psychological Review, 109,* 75–90. http://dx.doi.org/10.1037/0033-295X.109.1.75

Goldthorpe, J. H. (2000). *On sociology: Numbers, narratives, and the integration of research and theory*. Oxford: Oxford University Press.

Gottmann, J. (1980). Organizing and reorganizing space. In J. Gottmann (Ed.), *Centre and periphery: Spatial variation in politics* (pp. 217–224). Beverly Hills: Sage.

Green, D. P., & Shapiro, I. (1994). *Pathologies of rational choice theory: A critique of applications in political science*. New Haven: Yale University Press.

Gregory, D. (1994). *Geographical imaginations.* Oxford: Basil Blackwell.

Gregory, D. (1998). Power, knowledge and geography. *Geographische Zeitschrift, 86,* 70–93. http://www.jstor.org/stable/27818804

Gregory, D. (2015). Gabriel's map: Cartography and corpography in modern war. In P. Meusburger, D. Gregory, & L. Suarsana (Eds.), *Geographies of knowledge and power* (pp. 89–121). Knowledge and Space: Vol. 7. Dordrecht: Springer. doi:10.1007/978-94-017-9960-7_4

Harvey, D. (2005). Space as a key word. In D. Harvey, *Spaces of neoliberalization: Towards a theory of uneven geographical development* (pp. 93–115). Hettner-Lecture: Vol. 8. Stuttgart: Franz Steiner.

Haselton, M. G., Bryant, G. A., Wilke, A., Frederick, D. A., Galperin, A., Frankenhuis, W. E., & Moore, T. (2009). Adaptive rationality: An evolutionary perspective on cognitive bias [Special issue]. *Social Cognition, 27,* 733–763. doi:10.1521/soco.2009.27.5.733

Hennessey, B. A., & Amabile, T. M. (1988). The conditions of creativity. In R. J. Sternberg (Ed.), *The nature of creativity* (pp. 11–38). Cambridge: Cambridge University Press.

Hertwig, R., & Herzog, S. M. (2009). Fast and frugal heuristics: Tools of social rationality. *Social Cognition, 27,* 661–698.

Jöns, H. (2008). Academic travel from Cambridge University and the formation of centres of knowledge, 1885–1954. *Journal of Historical Geography, 34,* 338–362. doi:10.1016/j.jhg.2007.11.006

Kruglanski, A. W., & Orehek, E. (2009). Toward a relativity theory of rationality. *Social Cognition, 27,* 639–660.

Laclau, E., & Mouffe, C. (1985). *Hegemony and socialist strategy: Towards a radical democratic politics.* London: Verso.

Leed, E. (1981). *No Man's Land: Combat and identity in World War I.* Cambridge, UK: Cambridge University Press.

Lindenberg, S. (2013). Social rationality, self-regulation, and well-being. In R. Wittek, T. A. B. Snijders, & V. Nee (Eds.), *Handbook of rational choice social research* (pp. 72–112). Stanford: Stanford University Press.

Lippuner, R. (2005). *Raum, Systeme, Praktiken. Zum Verhältnis von Alltag, Wissenschaft und Geographie* [Space, systems, practices: On the relation between everyday life, science, and geography]. Sozialgeographische Bibliothek: Vol. 2. Stuttgart: Franz Steiner.

Lippuner, R., & Lossau, J. (2004). In der Raumfalle. Eine Kritik des spatial turn in den Sozialwissenschaften [Caught in the space trap: A critique of the spatial turn in the social sciences]. In G. Mein & M. Riegler-Ladich (Eds.), *Soziale Räume und kulturelle Praktiken. Über den strategischen Gebrauch von Medien* (pp. 47–63). Bielefeld: transcript.

Livingstone, D. N. (1995). The spaces of knowledge: Contributions towards a historical geography of science. *Environment and Planning D: Society and Space, 13,* 5–34. doi:10.1068/d130005

Livingstone, D. N. (2000). Making space for science. *Erdkunde, 54,* 285–296. doi:10.3112/erdkunde.2000.04.01

Livingstone, D. N. (2002). Knowledge, space and the geographies of science. In D. N. Livingstone, *Science, space and hermeneutics* (pp. 7–40). Hettner-Lecture: Vol. 5. Heidelberg: University Department of Geography.

Livingstone, D. N. (2003). *Putting science in its place: Geographies of scientific knowledge*. Chicago: University of Chicago Press.

Lösch, A. (1954). *The economics of location* (W. H. Woglom & W. F. Stolper, Trans.) (2nd rev. ed.). New Haven: Yale University Press. (Original work published 1940, 2nd ed. 1943)

Malecki, E. J. (2000). Knowledge and regional competitiveness. *Erdkunde, 54,* 334–351. http://www.jstor.org/stable/25647317

Massey, D. (1985). New directions in space. In D. Gregory & J. Urry (Eds.), *Social relations and spatial structures* (pp. 9–19). New York: St. Martin's Press.

Massey, D. (1999a). Imagining globalisation: Power-geometries of time-space. In D. Massey, *Power-geometries and the politics of space-time* (pp. 9–23). Hettner-Lecture: Vol. 2. Heidelberg: Heidelberg University, Department of Geography.

Massey, D. (1999b). Philosophy and politics of spatiality: Some considerations. In D. Massey, *Power-geometries and the politics of space-time* (pp. 27–42). Hettner-Lecture: Vol. 2. Heidelberg: Heidelberg University, Department of Geography.

Massey, D. (2005). *For space*. London: Sage.

Meusburger, P. (1998). *Bildungsgeographie. Wissen und Ausbildung in der räumlichen Dimension* [Geography of education: Knowledge and education in the spatial dimension]. Heidelberg: Spektrum Akademischer Verlag.

Meusburger, P. (1999). Subjekt—Organisation—Region. Fragen an die subjektzentrierte Handlungstheorie [Subject–organization–region: Questions on subject-centered action theory]. In P. Meusburger (Ed.), *Handlungszentrierte Sozialgeographie. Benno Werlens Entwurf in kritischer Diskussion* (pp. 95–132). Erdkundliches Wissen: Vol. 130. Stuttgart: Franz Steiner.

Meusburger, P. (2000). The spatial concentration of knowledge: Some theoretical considerations. *Erdkunde, 54,* 352–364. http://www.jstor.org/stable/25647318

Meusburger, P. (2003). "Wissen" als Erklärungsvariable in den Mensch-Umwelt-Beziehungen ["Knowledge" as explanatory variable in agent-environment relations]. In P. Meusburger & T. Schwan (Eds.), *Humanökologie. Ansätze zur Überwindung der Natur-Kultur-Dichotomie* (pp. 287–307). Erdkundliches Wissen: Vol. 135. Stuttgart: Franz Steiner.

Meusburger, P. (2008). The nexus of knowledge and space. In P. Meusburger, M. Welker, & E. Wunder (Eds.), *Clashes of knowledge: Orthodoxies and heterodoxies in science and religion* (pp. 35–90). Knowledge and Space: Vol. 1. Dordrecht: Springer. doi:10.1007/978-1-4020-5555-3_2

Meusburger, P. (2009). Milieus of creativity: The role of places, environments, and spatial contexts. In P. Meusburger, J. Funke, & E. Wunder (Eds.), *Milieus of creativity. An interdisciplinary approach to spatiality of creativity* (pp. 97–153). Knowledge and Space: Vol. 2. Dordrecht: Springer. doi:10.1007/978-1-4020-9877-2_7

Meusburger, P. (2015a). Knowledge environments in universities. *Hungarian Geographical Bulletin, 64,* 265–279. doi:10.15201/hungeobull.64.4.1

Meusburger, P. (2015b). Knowledge, Geography of. In J. D. Wright (Editor-in-chief), *International encyclopedia of the social & behavioral sciences* (2nd ed., Vol. 13, pp. 91–97). Oxford: Elsevier. http://dx.doi.org/10.1016/B978-0-08-097086-8.72126-X

Meusburger, P. (2015c). Relations between knowledge and power: An overview of research questions and concepts. In P. Meusburger, D. Gregory, & L. Suarsana (Eds.), *Geographies of knowledge and power* (pp. 19–74). Knowledge and Space: Vol. 7. Dordrecht: Springer. doi:10.1007/978-94-017-9960-7_2

Meusburger, P. (2017). Spatial mobility of knowledge: Communicating different categories of knowledge. In H. Jöns, P. Meusburger, & M. Heffernan (Eds.), *Mobilities of Knowledge* (pp. 23–50). Knowledge and Space: Vol. 10. Dordrecht: Springer. doi:10.1007/978-3-319-44654-7_2

Meusburger, P., Gregory, D., & Suarsana, L. (Eds.). (2015). *Geographies of knowledge and power*. Knowledge and Space: Vol. 7. Dordrecht: Springer. doi:10.1007/978-94-017-9960-7

Meusburger, P., & Schuch, T. (Eds.). (2012). *Wissenschaftsatlas of Heidelberg University: Spatio-temporal relations of academic knowledge production*. Knittlingen: Bibliotheca Palatina.

Mintzberg, H. (1979). *The structuring of organizations: A synthesis of the research*. Englewood Cliffs: Prentice Hall.

Moldaschl, M., & Stehr, N. (2010). Eine kurze Geschichte der Wissensökonomie [A brief history of the economics of knowledge]. In M. Moldaschl & N. Stehr (Eds.), *Wissensökonomie und Innovation. Beiträge zur Ökonomie der Wissensgesellschaft* (pp. 9–74). Marburg: Metropolis.

Navarro, D. J., Newell, B. R., & Schulze, C. (2016). Learning and choosing in an uncertain world: An investigation of the explore–exploit dilemma in static and dynamic environments. *Cognitive Psychology, 85,* 43–77. http://dx.doi.org/10.1016/j.cogpsych.2016.01.001

Paasi, A. (1991). Deconstructing regions: Notes on the scales of social life. *Environment and Planning A, 23,* 239–256. doi:10.1068/a230239

Pragmatics. (2010). *Random House Kernerman Webster's College Dictionary*. Retrieved June 2, 2016, from http://www.thefreedictionary.com/pragmatics

Radner, R. (2015). Decision and choice: Bounded rationality. In D. Wright (Editor-in-chief), *International encyclopedia of the social & behavioral sciences* (2nd ed., Vol. 5, pp. 879–885). Oxford: Elsevier. http://dx.doi.org/10.1016/B978-0-08-097086 -8.43028-X

Reckwitz, A. (2002). Toward a theory of social practices: A development in culturalist theorizing. *European Journal of Social Theory, 5,* 234–263. doi:10.1177/13684310222225432

Reckwitz, A. (2008). Grundelemente einer Theorie sozialer Praktiken [Principles of a theory of social practices]. In A. Reckwitz (Ed.), *Unscharfe Grenzen: Perspektiven der Kultursoziologie* (pp. 97–130). Bielefeld: Transcript.

Samuels, R., & Stich, S. P. (2015). Irrationality: Philosophical aspects. In D. Wright (Editor-in-chief), *International encyclopedia of the social & behavioral sciences* (2nd ed., Vol. 12, pp. 719–723). Oxford: Elsevier. http://dx.doi.org/10.1016/B978-0-08-097086 -8.63039-8

Schatzki, T., Knorr-Cetina, K., & Savigny, E., von (2001). *The practice turn in contemporary theory.* London: Routledge.

Schmid, C. (2005). *Stadt, Raum und Gesellschaft: Henri Lefebvre und die Theorie der Produktion des Raumes* [City, space, and society: Henri Lefebvre and the theory of the production of space]. Sozialgeographische Bibliothek: Vol. 1. Stuttgart: Franz Steiner.

Schönrich, G. (2005). Machtausübung und die Sicht der Akteure. Ein Beitrag zur Theorie der Macht [The exercise of power and the view of the actors: On the theory of power]. In G. Melville (Ed.), *Das Sichtbare und das Unsichtbare der Macht. Institutionelle Prozesse in Antike, Mittelalter und Neuzeit* (pp. 383–409). Cologne: Böhlau.

Schütz, A. (1932). *Der sinnhafte Aufbau der sozialen Welt: Eine Einführung in die verstehende Soziologie* [The phenomenology of the social world: An introduction to interpretive sociology]. Vienna: Springer.

Schwan, T. (2003). Clash of imaginations. Erfahrungswissenschaftliches Menschenbild versus postmoderne Konstruktionen [Clash of imaginations—Experience-based idea of man versus postmodern constructions]. In P. Meusburger & T. Schwan (Eds.), *Humanökologie: Ansätze zur Überwindung der Natur-Kultur-Dichotomie* (pp. 161–173). Erdkundliches Wissen: Vol. 135. Stuttgart: Franz Steiner.

Simon, H. A. (1956). Rational choice and the structure of environments. *Psychological Review, 63,* 129–138.

Simon, H. A. (1982). *Models of bounded rationality*. Cambridge, MA: MIT Press.

Simon, H. A. (1990). Invariants of human behavior. *Annual Review of Psychology, 41,* 1–19. doi:10.1146/annurev.ps.41.020190.000245

Smith, E. R., & DeCoster, J. (2000). Dual process models in social and cognitive psychology: Conceptual integration and links to underlying memory systems. *Personality and Social Psychology Review, 4,* 108–131. doi:10.1207/S15327957PSPR0402_01

Soja, E. (1985). The spatiality of social life: Towards a transformative retheorisation. In D. Gregory & J. Urry (Eds.), *Social relations and spatial structures* (pp. 90–127). London: Macmillan.

Stehr, N. (1994). *Knowledge societies*. London: Sage.

Stehr, N. (2005). *Knowledge politics: Governing the consequences of science and technology.* Boulder, CO: Paradigm Publishers.

Stehr, N., & Meja, V. (Eds.). (2005). *Society and knowledge: Contemporary perspectives in the sociology of knowledge and science* (2nd ed.). New Brunswick: Transaction Books.

Steiner, D. (2003). Humanökologie: Von hart zu weich. Mit Spurensuche bei und mit Peter Weichhart [Human ecology—From hard to soft: Seeking traces with Peter Weichhart]. In P. Meusburger & T. Schwan (Eds.), *Humanökologie: Ansätze zur Überwindung der Natur-Kultur-Dichotomie* (pp. 45–80). Erdkundliches Wissen: Vol. 135. Stuttgart: Franz Steiner.

Sternberg, R. E., & Lubart, T. I. (1999). The concept of creativity: Prospects and paradigms. In R. J. Sternberg (Ed.), *Handbook of creativity* (pp. 3–15). New York: Cambridge University Press.

Strack, F., & Deutsch, R. (2004). Reflective and impulsive determinants of social behavior. *Personality and Social Psychology Review*, *8*, 220–247. doi:10.1207/s15327957pspr0803_1

Strack, F., & Deutsch, R. (2007). The role of impulse in social behavior. In A. W. Kruglanski & E. T. Higgins (Eds.), *Social psychology: Handbook of basic principles.* (Rev. & exp. 2nd ed., pp. 408–431). New York: Guilford Press.

Todd, P. M., & Gigerenzer, G. (2000). Précis of simple heuristics that make us smart. *Behavioral and Brain Sciences, 23,* 727–780.

Todd, P. M., Gigerenzer, G., & the ABC Research Group (2012). *Ecological rationality: Intelligence in the world*. New York: Oxford University Press.

Tuan, Y. F. (1977). *Space and place: The perspective of experience*. Chicago: University of Chicago Press.

Weber, M. (1913). Über einige Kategorien der verstehenden Soziologie [Some categories of interpretive sociology]. *Logos: Internationale Zeitschrift für Philosophie der Kultur, 4,* 253–294.

Weber, M. (1980). *Wirtschaft und Gesellschaft: Grundriss der verstehenden Soziologie* [Economy and society: An outline of interpretive sociology] (5th ed.). Tübingen: Mohr & Siebeck. (Original work published 1922)

Weber, M. (1988). Geschäftsbericht und Diskussionsreden auf den deutschen soziologischen Tagungen (1910) [Annual report and discussions at German sociological conferences (1910)]. In Marianne Weber (Ed.), *Gesammelte Aufsätze zur Soziologie und Sozialpolitik* (2nd ed., pp. 431–491). Tübingen: Mohr. (Original work published 1912)

Weichhart, P. (1996). Die Region—Chimäre, Artefakt oder Strukturprinzip sozialer Systeme? [The region—Chimera, artifact, or structural principle of social systems]. In G. Brunn (Ed.), *Region und Regionsbildung in Europa: Konzeptionen der Forschung und empirische Befunde* (pp. 25–43). Schriftenreihe des Instituts für Europäische Regionalforschung: Vol. 1. Baden-Baden: Nomos.

Weichhart, P. (1999). Die Räume zwischen den Welten und die Welt der Räume. Zur Konzeption eines Schlüsselbegriffs der Geographie [The spaces between the worlds and the world of spaces: On the inception of a key concept of geography]. In P. Meusburger (Ed.), *Handlungszentrierte Sozialgeographie: Benno Werlens Entwurf in kritischer Diskussion* (pp. 67–94). Erdkundliches Wissen: Vol. 130. Stuttgart: Franz Steiner.

Weichhart, P. (2003). Gesellschaftlicher Metabolismus und Action Settings. Die Verknüpfung von Sach- und Sozialstrukturen im alltagsweltlichen Handeln [Social metabolism and action settings: The link between technical and social structures in everyday action]. In P. Meusburger & T. Schwan (Eds.), *Humanökologie: Ansätze zur Überwindung der Natur-Kultur-Dichotomie* (pp. 15–44). Erdkundliches Wissen: Vol. 135. Stuttgart: Franz Steiner.

Werlen, B. (1987). *Gesellschaft, Handlung und Raum: Grundlagen handlungstheoretischer Sozialgeographie* (3rd ed.) [Society, action and space: Principles of an action-oriented social geography] (3rd ed.). Erdkundliches Wissen: Vol. 89. Stuttgart: Franz Steiner.

Werlen, B. (1993a). Handlungs- und Raummodelle in sozialgeographischer Forschung und Praxis [Action and space models in social geographical research]. *Geographische Rundschau, 45,* 724–729.

Werlen, B. (1993b). *Society, action and space: An alternative human geography* (G. Walls, Trans.). London: Routledge.

Werlen, B. (1995). *Sozialgeographie alltäglicher Regionalisierungen: Bd. 1. Zur Ontologie von Gesellschaft und Raum* [Social geography of everyday regionalizations: Vol. 1. On the ontology of society and space]. Erdkundliches Wissen: Vol. 116. Stuttgart: Franz Steiner.

Werlen, B. (1997). *Sozialgeographie alltäglicher Regionalisierungen: Bd. 2. Globalisierung, Region und Regionalisierung* [Social geography of everyday regionalizations: Vol. 2. Globalization, region and regionalization]. Erdkundliches Wissen: Vol. 119. Stuttgart: Franz Steiner.

Werlen, B. (2010a). *Gesellschaftliche Räumlichkeit: Bd. 1. Orte der Geographie* [Social spatiality: Vol. 1. Places of geography]. Stuttgart: Franz Steiner.

Werlen, B. (2010b). *Gesellschaftliche Räumlichkeit: Bd. 2. Konstruktion geographischer Wirklichkeiten* [Social spatiality: Vol. 2. Construction of geographical realities]. Stuttgart: Franz Steiner.

Werlen, B. (2013). Gesellschaft und Raum: Gesellschaftliche Raumverhältnisse. Grundlagen und Perspektiven einer sozialwissenschaftlichen Geographie [Society and space: Society–space relationships—Principles and perspectives of a social science geography]. *Erwägen-Wissen-Ethik. Forum für Erwägungskultur, 24,* 3–16.

Werlen, B. (2015). From local to global sustainability: Transdisciplinary integrated research in the Digital Age. In B. Werlen (Ed.), *Global sustainability: Cultural perspectives and challenges for transdisciplinary integrated research* (pp. 3–16). New York: Springer.

Werlen, B., & Weingarten, M. (2003). Zum forschungsintegrativen Gehalt der (Sozial) Geographie [About the integrative substance of (social) geography]. In P. Meusburger & T. Schwan (Eds.), *Humanökologie. Ansätze zur Überwindung der Natur-Kultur-Dichotomie* (pp. 197–216). Erdkundliches Wissen: Vol. 135. Stuttgart: Franz Steiner.

Wittek, R., Snijders, T. A. B., & Nee, V. (Eds.). (2013). *Handbook of rational choice social research*. Stanford: Stanford University Press.

World Commission on Environment and Development. (1987). *Our common future.* Oxford: Oxford University Press.

Zierhofer, W. (2002). Speech acts and space(s): Language pragmatics and the discursive constitution of the social. *Environment and Planning A, 34,* 1355–1372. doi:10.1068/a34198