are relative locations between places learned?', 'how are maps interpreted and used for location and navigation tasks?', and 'how is spatial knowledge related to spatial behaviour?'. Cognitive mapping, then, is a component of the broader field of spatial cognition research – research that concerns the understanding of spatial thought *per se*. Spatial cognition, in turn, is an important sub-part of cognition *per se*, and its understanding is thought to be central to understanding 'learning and knowing' in general (Johnson, 1987; Lakoff, 1987).

As detailed in the literature (for example, see Kitchin 1994), the terms 'cognitive mapping' and 'cognitive map' are not without their problems. The term 'cognitive mapping' has been used in three different ways. First as a descriptive title for the field of study that investigates how people learn, remember and process spatial information about an environment. Second, it has been used as a descriptive phrase for the process of thinking about spatial relations. Third, it has been used as a descriptive name for a methodological approach to understanding cognition in general, consisting of the construction of 'maps' of cognitive processes (e.g., Swan and Newell, 1994). Similarly, the term 'cognitive map' has been used in a variety ways, nearly all relating to a person's knowledge of spatial relations. Tolman (1948), the originator of the term 'cognitive map', hypothesized that we construct a map-like representation (i.e., a cognitive map) within the 'black box' of the nervous system, which is then used to guide our everyday movements. In this instance, the representation is structured in the same way as a cartographic map. The implication, then, is that the cognitive map acquires Euclidean properties with repeated environmental experience. So, 'cognitive' map was used by Tolman as an *explicit statement*, with spatial knowledge functionally and representationally equivalent to a map (also see O'Keefe and Nadel, 1978). The term has also been used as an *analogical device* where spatial knowledge is assumed to be like a cartographic map (Levine *et al.*, 1982, Kuipers, 1982); and as a *metaphorical device* to label spatial knowledge as functionally equivalent to a map – we act as if we have a map-like representation in our minds, although it is acknowledged that here 'map' is a hypothetical construct (Moore and Golledge, 1976; Newcombe, 1985; Siegel and Cousins, 1985). Finally, in some cases the term 'cognitive map' has been used as a descriptive term for a conceptual drawing of an individual's cognitive processes and is the outcome of the methodological process of cognitive mapping (third definition above). In this book, we use the term 'cognitive mapping' as a descriptive title for the field of study concerned with understanding spatial thought and 'cognitive map' to denote a person's spatial knowledge of the environment regardless of form.

Surprisingly, cognitive mapping research is a relatively recent endeavour. Whilst there were isolated studies such as Trowbridge (1913) and Hardy (1939), the vast majority of research has taken place over the course of the past forty years. This research, initiated by the seminal work of Kevin Lynch

(1960), is unusual in that it has always been multidisciplinary (although not always interdisciplinary) in character. Although psychology, particularly cognitive and developmental psychology, has tended to dominate theoretical and empirical studies, other disciplines, notably geography, but also planning, architecture, anthropology, computer science, information science, cognitive science and neuro-psychology have made significant contributions.

A reflection of its multidisciplinary character is that just five years after the publication of Lynch's book, representatives from ten separate disciplines met at the 1965 Association of American Geographers' conference in Columbus, Ohio, to present research concerning the links between spatial thought and spatial behaviour. This meeting ultimately led to the establishment of the Environmental Design & Research Association (EDRA) and to the beginning of the cross-disciplinary journal, *Environment and Behavior* (1969) (Kitchin *et al.*, 1997). These links continued to develop in the early 1970s leading to the publication of a number of edited collections with a cross-disciplinary range of authors (e.g., Downs and Stea, 1973, 1977; Moore and Golledge, 1976). However, it is fair to state that at this time links were more usually forged through disciplines approaching psychology, and using psychological thought and techniques, than vice versa (Gärling and Golledge, 1993). During the late 1970s, links started to unravel – mainly due to crises in confidence in behavioural geography (under which most geographic, cognitive mapping research was conducted). Behavioural geography was criticized by humanists for being mechanistic and dehumanizing, and by structuralists for failing to acknowledge the broader social and cultural context in which decision-making operated (namely capital relations). While some links remained in place, notably through the work of Golledge, it was not until the early 1990s that multidisciplinary links were extensively re-forged, leading to range of interdisciplinary research, notably between geographers and psychologists. Instrumental in this process has been the National Science Foundation funded National Center for Geographic Information and Analysis (NCGIA). During the ten years of the NCGIA's existence, the Center has sponsored and funded cross-disciplinary research through its many research initiatives including Languages of Spatial Relations, Spatial-Temporal Reasoning, Multiple Representations, User-Interface Design, Common-Sense Geographic Reasoning, Scale and Cognition in Geographic Space, Dynamic Representations, and Multiple Modalities and Multiple Reference Frames for Spatial Knowledge. Many of the authors in this collection have taken part in these initiatives, and are now engaged in interdisciplinary research.

Theoretically and empirically, cognitive mapping research has come a long way in the last forty years, and a number of core sub-fields are discernible – some of these are reflected in the chapter titles in this book. Throughout this period a number of specific theories relating to processes of spatial thought have been developed, tested and refined. For example,