HANDBOOK OF SPATIAL LOGICS
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Edited by

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Preface

Space, with its manifold layers of structure, has been an inexhaustible source of intellectual fascination since Antiquity. The science that began with the empirical discoveries of the Egyptian ‘rope-stretchers’, and that has inspired many of the greatest developments in mathematics over the centuries, now comprises such topics as spatial databases, automated geometrical reasoning and digital image processing. In this long intellectual history, however, one relatively recent, yet crucial, event stands out: the rise of the logical stance in geometry. Fundamental to this development is the analysis of geometrical structures in relation to the formal languages used to describe them, and the recognition of the special mathematical challenges—and opportunities—which such an analysis presents. The interplay between logic and geometry is the subject of this book.

By a spatial logic, we mean any formal language for describing geometrical entities and configurations, where ‘geometrical’ is understood in a broad sense. Unlike their well-studied temporal counterparts, spatial logics have been curiously neglected in the literature on mathematical logic, despite some early pioneering work by Tarski and others on the foundations of geometry and topology in the middle years of the previous century. Only in the last decade have spatial logics attracted renewed attention from logicians, partly as a response to work in such diverse fields as artificial intelligence, database theory, physics and philosophy.

Today, there is a fast-growing body of literature on spatial logics, with motivations ranging from computational issues to the foundations of knowledge and information. But, for the newcomer to the field, this diversity of influences and approaches constitutes something of a mixed blessing: the field may be in a state of rapid development; but there is as yet no common research agenda, and no common vocabulary to allow ideas to be shared across disciplines. The aim of this book is to provide a resource which presents a view of the best current work in different communities worldwide, and which makes a first attempt at systematic linkage. We hope this will stimulate the development of spatial logic itself, but beyond this narrower purpose, we also hope to have provided a text that should be of value to non-logicians with an interest in formal theories of space.

The book consists of a general introduction followed by fourteen invited contributions on various topics in spatial logic, with authors representing the major active centres in the field. Each of these chapters provides a self-contained overview of its topic, describing the principal results obtained to date, explaining the methods used to obtain them, and listing the most important open problems.
Every contributed chapter has one or more ‘second readers’—experts in the field, who worked with the authors and editors to help ensure a comprehensive (and comprehensible) account of the topic in question.

The book is intended as a technical resource for academic researchers and graduate students. Familiarity with basic undergraduate-level logic, topology and geometry is generally assumed. Very roughly, the criterion of accessibility we have worked to is that a good graduate student interested in the area should, by working through any of these chapters, be able to acquire a firm understanding of the current state-of-the-art in that topic within the space of a few weeks. Jointly, these chapters provide—to the extent that this is ever possible in a rapidly evolving discipline—a comprehensive survey of the field of spatial logic as it stands today.

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