Preface

This book grew out of lectures to first year graduate students of the Department of Polymer Science at the University of Massachusetts (Amherst, USA) during 2008–2010. On that occasion, I realized that the excellent textbooks on x-ray scattering I know and admire were mainly written by physicists, who used mathematics to make things clear. This was evidently not the approach that appealed to the students I was teaching. First, they had a rather variable background with often limited mathematics. Second, they were eager to know more about x-ray scattering as a user, but did not intend to become an expert. In my lectures I tried to accommodate these points. The notes were improved at various other occasions, notably lecturing in 2011 at the University of Science and Technology of China (Hefei, China) and in 2013 at the Leibniz Institute for Interactive Materials (DWI, Aachen, Germany).

Upon shaping the lecture notes into a book, I set several requirements. First, I aimed at a paperback of limited size that people would like to have on hand rather than on a shelf. Second, I wanted to include a large variety of examples of x-ray scattering of soft matter. Third, I liked, and so I kept, a chapter from my original notes on the different types of order/disorder in soft matter that play such an important role in modern self-assembling systems. Evidently, this combination did not make life easy, in particular regarding the coverage of the basics of x-ray scattering. I had great difficulties resisting inclusion of more material and it will be easy to point out subjects that are missing. Other people may feel there is still too much mathematics. Also, I did not aim at a practical guide to x-ray scattering but rather at explaining basic principles in a simple way. In spite of all the compromises, I believe there is a niche for a book of this type.

Necessarily, much material has been recycled from various sources. Usually this regards general knowledge that requires no specific reference. Still, I apologize to colleagues who might recognize a familiar sentence or certain aspects of a figure. I suggest considering it as a compliment to their efforts. However, I have tried to be complete in acknowledging the origin of experimental data. In fact, many of the examples are from my own work. Not so much because they are better than other ones, but because I happen to know them well, with all details readily available.

At the start of this project, the old book by D. W. L. Hukins, *X-ray Diffraction by Disordered and Ordered Systems* (Pergamon, 1981) was an important source of inspiration, especially in showing how valuable a small book can be. On a different level, I owe much to *Elements of Modern X-Ray Physics* by J. Als-Nielsen and D. McMorrow (Wiley, 2011). At some stage, I came to know the elegant book

Elementary Scattering Theory by D. S. Sivia (Oxford, 2011). It provides, in an approachable way, the mathematical toolbox for scattering that I did not want to emphasize. Hence, it is a perfect companion to this volume.

In the course of writing, I came across the work of Alfred Jensen. I learned that science provided the inspiration for much of his art and was a great part of the formulation of his diagrams and paintings. The Estate of Alfred Jensen kindly granted permission to reproduce one of his paintings on the cover of this book.

I am grateful to Björn Schulte and Hélène Freichels for their comments on the first complete version of the text, and to Khosrow Rahimi for his invaluable help in shaping the many figures. Finally, I want to express my gratitude to Martin Möller for providing, at DWI, the opportunity to continue my professional life after my formal retirement. At this stage of my career I am strongly motivated to share my experience in x-ray scattering of soft matter with a new generation of young researchers. I hope and trust that this book will find its way to their benefit.

Wim H. de Jeu
(www.wimdejeu.nl)