

Preface

The seeds of this book have been planted in the far east, where I wrote lecture notes for international schools in Tianjin, China in 2007, and in Bangkok, Thailand in 2011. I then realized that an up-to-date text for beginning noncommutative geometers on the applications of this rather new mathematical field to particle physics was missing in the literature.

This made me decide to transform my notes into the form of a book. Besides the given challenge inherent in such a project, this was not made easy because of recent, rapid developments in the field, making it difficult to choose what to include and to decide where to stop in my treatment. The current state of affairs is at least touched upon in the final chapter of this book, where I discuss the latest particle physics models in noncommutative geometry, and compare them to the latest experimental findings. With this, I hope to have provided a path that starts with the basic principles of noncommutative geometry and leads to the forefront of research in noncommutative geometry and particle physics.

The intended audience consists of mathematicians with some knowledge of particle physics, and of theoretical physicists with some mathematical background. Concerning the level of this textbook, for mathematicians I assume prerequisites on gauge theories at the level of, e.g., [1, 2], and recommend to first read the book [3] to really appreciate the last few chapters of this book on particle physics/the Standard Model. For physicists, I assume knowledge of some basic algebra, Hilbert space, and operator theory (e.g., [4, Chap. 2]), and Riemannian geometry (e.g., [5, 6]). This makes the book particularly suitable for a starting Ph.D. student, after a Master's degree in Mathematical/Theoretical Physics including the above background.

I would like to thank the organizers and participants of the aforementioned schools for their involvement and their feedback. This also applies to the MRI-Masterclass in Utrecht in 2010 and the Conference on index theory in Bogotá in 2008, where [Chap. 5](#) finds its roots. Much feedback on previous drafts was gratefully received from students in my class on noncommutative geometry in Nijmegen: Bas Jordans, Joey van der Leer, and Sander Uijlen. I thank my students and co-authors Jord Boeijink, Thijs van den Broek, and Koen van den Dungen for allowing me to transcribe part of our results in the present book form. Simon Brain, Alan Carey, Roberta Iseppi, and Adam Rennie are gratefully acknowledged for their feedback and suggested corrections. Strong motivation to writing this

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