There are many bits and pieces of folklore in mathematics that are passed down from advisor to student, or from collaborator to collaborator, but which are too fuzzy and non-rigorous to be discussed in the formal literature. Traditionally, it was a matter of luck and location as to who learned such folklore mathematics. But today, such bits and pieces can be communicated effectively and efficiently via the semiformal medium of research blogging. This book grew from such a blog.

In 2007, Terry Tao began a mathematical blog to cover a variety of topics, ranging from his own research and other recent developments in mathematics, to lecture notes for his classes, to non-technical puzzles and expository articles. The articles from the first year of that blog have already been published by the AMS. The posts from 2008 are being published in two volumes.

This book is Part I of the second-year posts, focusing on ergodic theory, combinatorics, and number theory. Chapter 2 consists of lecture notes from Tao’s course on topological dynamics and ergodic theory. By means of various correspondence principles, recurrence theorems about dynamical systems are used to prove some deep theorems in combinatorics and other areas of mathematics. The lectures are as self-contained as possible, focusing more on the “big picture” than on technical details.

In addition to these lectures, a variety of other topics are discussed, ranging from recent developments in additive prime number theory to expository articles on individual mathematical topics such as the law of large numbers and the Lucas–Lehmer test for Mersenne primes. Some selected comments and feedback from blog readers have also been incorporated into the articles.

The book is suitable for graduate students and research mathematicians interested in broad exposure to mathematical topics.

Poincaré’s Legacies, Part I
pages from year two of a mathematical blog

Terence Tao