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Sinopsis

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"Regularization techniques" is the common name for a variety of methods used to make sense of divergent series, divergent integrals, or traces of linear operators in infinite-dimensional spaces. Such methods are often indispensable in problems of number theory, geometry, quantum field theory, and other areas of mathematics and theoretical physics. However arbitrary and noncanonical they might seem at first glance, regularized sums, integrals, and traces often contain canonical concepts, and the main purpose of this book is to illustrate and explain this.

This book provides a unified and self-contained mathematical treatment of various regularization techniques. The author shows how to derive regularized sums, integrals, and traces from certain canonical building blocks of the original divergent object. In the process of putting together these "building blocks", one encounters many problems and ambiguities caused by various so-called anomalies, which are investigated and explained in detail. Nevertheless, it turns out that the corresponding canonical sums, integrals, sums, and traces are well behaved, thus making the regularization procedure possible and manageable.

This new unified outlook on regularization techniques in various fields of mathematics and in quantum field theory can serve as an introduction for anyone from a beginning mathematician interested in the subject to an experienced physicist who wants to gain a unified outlook on techniques he/she uses on a daily basis.