# Part II
# Effective Descriptions

Effective descriptions provide powerful tools for analyzing quantum systems as well as for understanding them in intuitive terms. Well-known examples are effective potentials in condensed-matter physics, or the low-energy effective action in particle physics. The general setting and applicability of effective descriptions is, however, much wider. They can be used for conceptual questions, as a shortcut to derive the behavior of certain quantum states, and for numerical purposes. Effective descriptions are, moreover, much more amenable to certain approximation schemes, such as semiclassical ones, than direct quantum states. Even issues of constrained systems, including properties of physical states, anomalies or the problem of time, can be addressed at this level.

It is not always easy to derive effective formulations for a regime of interest in a given quantum system. But once models have been identified in which they can be computed, more general properties can be added on by perturbation theory. This formulation has been achieved for quantum cosmology, as described in this part. Chapter 13 will deal with general issues of effective descriptions such as the relation to the low-energy effective action, more general types of effective actions, and physical Hilbert-space issues for constrained systems.