PREFACE

"Anesthesia" is a reversible, drug-induced state that most importantly (for the surgeon, at least!) causes an inability to generate a motor response to what would normally be painful stimuli. The general anesthetic state generally includes unconsciousness and amnesia. These features are considered to reside in the central nervous system, and in fact, when absent (e.g., during normal "awake" function), they collectively define consciousness. Thus, the study of general anesthesia overlaps with the study of consciousness—probably the most enigmatic state that exists! It should not be surprising then that the range of experimental and theoretical approaches to understanding the anesthetic state is very large. We have attempted to capture the scope, complexity, and significance of the many approaches to understanding the state of anesthesia in this two-volume set of *Methods in Enzymology*. This is, perhaps, an unusual collection for *MIE*, in that many of the approaches do not fit the term "enzymology," or for that matter, even chemistry or biochemistry. This first volume, *Chemical and Biochemical Approaches for the Study of Anesthetic Function, Part A*, details computational approaches, animal models, photolabeling technique, the "simplest" anesthetic xenon, and electrophysiology approaches. Computational approaches offer windows into understanding anesthetic function at both molecular and systems-level scales, with an increasing number of ion channel protein crystal structures available to guide both computation and experiment. In addition, the appropriate means to phenotype various genetic models is crucially important, as the activity of no single-target molecule can serve as a reliable surrogate for the state of anesthesia. Xenon provides a uniquely powerful single-atom probe to investigate anesthetic–protein and anesthetic–lipid interactions by many experimental approaches. Electrophysiology allows the measurement of electrical phenomena associated with nervous activity, on varying time and size scales, ranging from single-ion channels, to cells and intact organs. We have sought out the recognized experts in each field, to provide a succinct account of what these approaches can contribute and how to employ them most effectively. With such a diverse and intense campaign, one might have thought the mechanism of anesthesia would have succumbed by now! But this could not be further from the truth; despite finding ever-increasing use in modern medicine, anesthesia remains almost as enigmatic as when it was discovered over 170 years ago. Through further deployment and refinement of these approaches, and many more to be developed, we may finally reveal the mechanisms underlying anesthesia, and eventually improve it.

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