

Preface

Natural sleep and the accompanying loss of consciousness is part of everybody's life. Similarly, general anaesthesia is part of the daily routine in hospital surgery whose aim is, *inter alia*, to induce hypnosis in patients. The two phenomena share some common features, however differ in other aspects. For instance, it has been shown that the final state in deep sleep and anaesthetic-induced unconsciousness are remarkably similar. However a sleeper may be woken up by shaking or noise whereas an anaesthetized person cannot be brought back to consciousness by external stimuli.

Notwithstanding the importance of sleep for all mammals and many other species and the successful administration of general anaesthesia in surgery, the physiological mechanisms of sleep and anaesthesia are far from being understood. The current book aims to elucidate the similarities and differences of sleep and anaesthesia and gives an overview over corresponding experimental and theoretical techniques. The idea for the book came up after two workshops on the same topic that I had organized during the Computational Neuroscience Conferences 2007 in Toronto and 2009 in Berlin. Many of the contributors to this book have participated in these workshops and stimulated discussions triggered the idea to summarize the different experimental and theoretical approaches. Moreover, interestingly not few contributors to this book working on either sleep or anaesthesia have switched between the two topics in the last years illustrating the strong link between the two research topics.

Typical experiments apply invasive electrophysiology, encephalography and high-resolution imaging technique to extract neural correlates during sleep or anaesthesia. Theoretical models aim to explain the experimentally observed activity and attempt to extract the corresponding underlying neural mechanisms frequently by mathematical models. Since both approaches fertilize each other, the book brings together both experimental and theoretical studies reflecting the current status of research and demonstrating their strong link. The first chapter introduces to the physiological basis of sleep and anaesthesia mostly based on experiments and discusses similarities and differences in physiology. The subsequent chapter then introduces into a unifying theoretical model which explains elements of both sleep and anaes-

thetia. More detailed investigations on either sleep or anaesthesia follow in the subsequent two separate sections.

The book gives an overview of the major approaches and concepts in experiments and theory and hence is ideal for graduate students in anesthesiology and sleep science. It also serves theoretical neuroscientists who are new to anesthesia and sleep and would like to gain an overview of the recent theoretical achievements and hypothesis.

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Nancy, France

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Sleep and Anesthesia

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