The book is divided into 10 topics (or chapters) each describing pertinent tests within a particular clinical system. Basic topics are covered within the first four chapters (airway, respiratory, cardiovascular, and central nervous systems). The remaining chapters focus on assessment of the peripheral nervous system and renal, metabolic, and endocrine function, including investigations relating to patients within the labour ward and intensive care settings. Two particularly interesting chapters outline the principles of haematology and coagulation analysis and therapeutic drug monitoring.

Each chapter follows a prescriptive formula to describe individual tests: Indications, How it is done, Interpretation, Limitations, and Complications. Such a formulaic approach provides an efficient means of presenting a large amount of dry, factual but nevertheless relevant information while minimizing the need for time-consuming reference to larger texts. As acknowledged in the preface, the content is not exhaustive but rather is limited to ‘a brief and practical overview’ of relevant clinical investigations. In this format, the book is easily read and is ideally suited as a quick reference guide to assist with the correct interpretation of perioperative investigations.

In terms of balance and relevance of this book to anaesthetists and intensivists, several points are worth mentioning. Discussion of cardiopulmonary exercise testing is restricted to less than two pages and does not follow the prescriptive formula described above, whereas a disproportionately large discussion of cardiotocograph analysis in the labour ward is presented over five pages. It would have been useful to include more detailed information on anaesthetic allergy testing. For example, highlighting the indications for skin testing and the difficulties associated with its interpretation, rather than limiting coverage simply to mast cell tryptase and histamine assays at the end of the renal metabolic and endocrine systems. Comparatively, few references are cited which detracts from its credibility as an evidence-based teaching aide. A list of subheadings is included on the first page of each chapter, but the lack of an index makes finding information on a specific test slightly awkward.

To their credit, the editors have successfully condensed a large amount of diverse, but extremely useful information into a relatively accessible and palatable format. Overall, this is an excellent, easily read reference book which will no doubt find its way into the list of ‘must have’ texts for trainees preparing for anaesthetic and intensive care exams. It will also serve as a useful framework for teaching and for everyday clinical management by providing up-to-date information on the range of investigative and therapeutic options necessary for perioperative optimization.

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This book summarizes contributions to a 2007 conference on brain research and is focused on anaesthetic modulation of consciousness and memory. Chapters from the conference are supplemented by chapters on anaesthesia and sleep, computational analysis of the state of anaesthesia, and the phenomenon of ‘anaesthesia awareness’. The text attempts to extend from underpinning molecular and cellular mechanisms to overall anaesthetic effects on the whole patient. Almost all of the chapter authors come from academic departments in the USA supplemented by four from New Zealand. Helpfully, each chapter begins with an abstract, a set of keywords, and an introduction.

It is a reasonable question to ask why this is important, given the everyday nature of general anaesthesia and the stark reality that we do not have to know how the drugs work or the true nature of consciousness in order to keep somebody safe and asleep for surgery. The editors tackle this challenge head on, suggesting that discovery of new anaesthetic drugs, tackling side-effects, and extending our scope of practise requires a sound understanding of how it all works. Further, understanding the drivers of unconsciousness with amnesia could assist development of improved anaesthetic depth monitors.

After the introduction, Hemmings tackles the molecular targets of general anaesthetics. He starts by reminding us that, among the plethora of putative sites of action, we should focus on those in the correct part of the central nervous system which are sensitive to anaesthetics at the right doses. We now know that most anaesthetic agents influence the function of several ion channels and in the case of GABA\(_A\) receptors this is defined at a molecular level, but we still lack information on how these effects on channels alter brain function.

In a chapter on the relevance of the study of sleep to anaesthesia, Watson reminds us that, among the plethora of putative sites of action, we should focus on those in the correct part of the central nervous system which are sensitive to anaesthetics at the right doses. We now know that most anaesthetic agents influence the function of several ion channels and in the case of GABA\(_A\) receptors this is defined at a molecular level, but we still lack information on how these effects on channels alter brain function.

In a chapter on anaesthetic action at a systems level, Banks and others explore the effects of isoflurane on auditory cortex and sensory processing in the hope of relating these to synaptic physiology and network firing activity. Anaesthetic modulation of auditory evoked responses correlates reliably with depression of consciousness and impairment of memory and this has been exploited to monitor depth of anaesthesia. While cortical processing (and its ‘top-down’ effects) is markedly impaired by anaesthetics, sub-cortical responses to sensory information often persist and are sometimes enhanced by anaesthetics. Anaesthetics therefore have more effect on descending signals and
cortical–cortical processing than on ascending (‘bottom-up’) signals.

Building on the importance of cortical effects of anaesthetics, Hudetz concludes that under general anaesthesia, the brain preserves its reactivity to sensory stimulation but the information is not integrated at the cortical level. Cortical architecture provides local clusters with high connectivity which are sparsely connected across the brain. This ‘small-world’ topology gives efficient information exchange with minimum wiring but makes the brain particularly vulnerable to anaesthesia. This takes us to the splendidly named Cortical Disintegration Theory of Anaesthetic-Induced Unconsciousness. The posterior parietal association cortex seems to be the key and it is here that the observed effects of anaesthetics with different mechanisms of action at the cellular and molecular level may converge.

The chapter on positron emission tomography demonstrates, with colourful images, that anaesthetics put the cortex to sleep but the thalamus seems to go to sleep at the same time. Other data suggest that depression of nicotinic function in the thalamus may be a core anaesthetic effect. We are left unclear whether cortical effects, thalamic effects, or both are the key to anaesthesia.

The chapter on anaesthesia state transition (i.e. going to sleep and waking up) suggests that transition abruptly from unconsciousness to alert states occurs with minimal changes in drug concentration, suggesting that underlying electrophysiology may be non-linear. Using computer models of groups of neurones, these transitions may be reproduced and plausible cortical electrical activity generated in simulations.

The description of anaesthetic drug effects on the hippocampus makes the case that these drive the loss of recall induced by sub-hypnotic doses of anaesthetics. Candidate molecular mechanisms abound but different lines of research ranging from electrodes through brain slices to whole animals all point to the thalamus. Hippocampal theta-oscillations—near sinusoidal fluctuations of extracellular field potentials—correlate with behaviours, REM sleep, and states of immobility. In short, they may be considered a sign that the hippocampus is ‘on-line’ and it follows that anaesthetic modulation of the hippocampal theta rhythm may drive amnesia. The amnestic effects of propofol at sub-hypnotic doses have been detailed. Sensory input is perceived and then encoded into working memory (semantic and episodic) before being forgotten or passed into long-term memory. At higher (anaesthetic) doses of propofol where unresponsiveness is present, no episodic memory is formed. At lower doses, information is perceived but not sufficiently processed to be remembered. At the lowest doses, memories may be briefly encoded but then lost. The discussion of amnesia is balanced by a review of anaesthetic awareness, its causes, and consequences.

Overall, this book contains a mass of detail and the individual chapters complement each other well. It is high-level stuff and will be beyond the interests of most clinicians. For anyone contemplating research or background reading in this area, the book is a terrific resource and will save a huge amount of time. Crucially, it is much more than an assemblage of facts—there is analysis and explanation and plenty of it. The book is expensive but, nevertheless, this is a truly excellent book and packed with information and opinion. If you do find a copy then have a good browse!

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