
Preface

A spectacular progress in uncovering the mysteries of sleep took place in the twentieth century which is continuing in the twenty-first century. What once remained shrouded in mystery and in the realm of vivid imagination of writers, scholars, artists, philosophers, poets, and religious leaders is now finding its rightful place beyond the fantasy of dreamers in the real world of neuroscience. We now know a great deal about neurobiology of sleep and dream, but much remains to be solved. Why do we remain awake? What happens if we are sleep deprived? Why do we need sleep? These questions keep popping up without a satisfactory answer. Sleep is an indispensable state of human existence and is noted in all mammalian and non-mammalian including avian and reptilian species. We have learned a lot from the animal kingdom. We know that the newborn dolphins continue to swim immediately after birth along with mother dolphins (to protect the newborn), totally sleep deprived for weeks without any long-term adverse effects on the brain or the body. In contrast, sleep deprivation experiments of Rechtschaffen and co-workers in rats on a carousel (“the disk-over-water” technique) produced emaciated animals despite increased food intake but with eventual death. Later sleep deprivation experiments using different techniques failed to reproduce similar results. Of course, it is not possible to perform complete sleep deprivation experiments on humans. Another mysterious finding is unihemispheric sleep in dolphins, porpoise, and pilot whales. This is thought to represent adaptation to life in water. Do humans have similar asymmetric or unihemispheric sleep? There are indications from polysomnographic recordings of severe obstructive sleep apnea (OSA) patients with hypoxemia using sophisticated computerized coherence analysis that such interhemispheric slow wave sleep asymmetry is also present in human maximally during apneic arousals and REM sleep, probably related to some brain stress or some unknown physiological adaptive mechanism. Another notable feature is the coexistence of sleeping and waking brain regions in arousal parasomnias which is reminiscent of sleeping brain in one half and waking brain in the other half of the cetaceans. Another example of such similarity is simultaneous presence of local sleep and waking regions during normal human sleep.

Sleep has been described in all different ways by poets and writers.

*“What is more gentle than a wind in summer?
...What is more tranquil than a musk-rose blowing?
...What, but thee Sleep? Soft closer of our eyes!
...Thee for enlivening all the cheerful eyes
That glance so brightly at the new sun-rise.*

—John Keats, “*Sleep and Poetry*”

*“Not poppy nor mandragora
Nor all the drowsy syrups of the world,
Shall ever medicine thee to that sweet sleep
Which thou owedst yesterday.”*

—William Shakespeare, *Othello*
Act iii, Scene 3

*“Sleep...
The death of each day’s life, sore labour’s bath,
Balm of hurt minds, great nature’s second course,
Chief nourisher in life’s feast.”*

—William Shakespeare, *Macbeth*
Act ii, Scene 2

Famous novelists of the past centuries have on occasion given colorful descriptions of characters seemingly having symptoms of sleep disorders long before these entities entered into the scientific literature. A case in point is a description of narcolepsy-like symptoms in Edgar Allan Poe’s “Premature Burial” (published in 1844, 36 years before Gelineau’s introduction of the term narcolepsy in 1880). There are other examples: A description of sleep paralysis in the character “Ishmael” in Herman Melville’s “Moby-Dick” published in 1851 (25 years before the use of the term “night palsy” by Weir Mitchell in 1876); a description of RBD-like symptoms in Don Quixote by Miguel Cervantes in “Man of La Mancha” published in 1605 (381 years before the clinical description of RBD in 1986); and William Shakespeare’s description of sleep walking of Lady Macbeth around 1606 long before scientific studies to characterize this arousal parasomnia were performed in the twentieth century.

Despite electrifying progress in sleep research, the public and profession alike are still not sufficiently cognizant of the fact that “sleep attack” or sleep deprivation (especially when combined with alcohol) can be as lethal as a “heart attack” or “brain attack” (stroke).

Most of the sleep problems do not present acutely (but some may initiate acute and emergent events triggering as much drama as a heart attack or stroke; for example, there are reports of sudden cardiac arrhythmias or even sudden death associated with OSA and severe hypoxemia).

Unquestionably, considerable progress has been made in the last three to four decades encompassing basic science, technical, clinical, and therapeutic aspects of sleep medicine. Dedicated sleep scientists and clinicians, many organizations and foundations (regional, national, and international) should be credited for pushing the topic of sleep medicine forward. Sleep medicine is now recognized to be an independent specialty with its own training program. We are all dreaming and eagerly awaiting the day when sleep medicine will be considered an independent department with its own administrative, clinical, and research staff similar to other disciplines (e.g., departments of medicine, surgery, obgyn, and others).

Since the publication of the first edition in 1994, the second edition in 1999, and the third edition in 2009, many new advances have been made and hence the need for this fourth edition. There are 19 new chapters in this edition to address new advances (Chaps. 4, 9, 10, 12, 15, 16, 25, 31, 33, 35, 40, 42, 43, 49, 55, 56, 57, 58) including some topics (e.g., Chaps. 25, 33, and 36) which had not been addressed in depth in the last edition. I will highlight a few of these new chapters (numbers 10, 15, 16, 35, 43, 58). These are unique chapters and are highly relevant to the science and practice of sleep medicine, but unfortunately, not addressed adequately in most of the available standard textbooks of sleep medicine. There are considerable similarities and differences between altered consciousness induced by anesthetic agents and sleep, and sleep clinicians and scientists must be aware of these facts (Chap. 10). Anyone involved in clinical trial must have some basic knowledge about statistical principles, and hence, a new chapter (no. 15) is devoted to this topic, outlining the principles in a lucid and easily comprehensible manner. A sleep clinician involved in interpretation and recording of polysomnographic and other technical recordings should have some fundamental knowledge about instrumentation and signal analysis (Chap. 16) to appreciate the fallacies and pitfalls of such recordings. Occult sleep disordered breathing (SDB) may pose imminent danger to any patient about to undergo a surgical procedure. It is, therefore, important to be aware of the presence of SDB in the preoperative, perioperative, and postoperative periods (Chap. 35). Another important topic for sleep clinicians and scientists to understand is the difference among sleep, coma, and vegetative and minimally conscious states, but again these topics are

not addressed in the standard textbooks of sleep medicine. I am fortunate and grateful to have the world's leading expert, Dr. Steven Laureys, addressing these subjects as the lead author (Chap. 43). Complementary and alternative medicine (CAM; Chaps. 56 and 57) is increasingly becoming popular although valid scientific data after randomized control trials (RCTs) are not available for most of the CAM therapies. Finally, a fascinating topic (Chap. 58) is sleep in extreme environment (e.g., space travel) for which we have some limited data but which, I believe, will be a hot topic in future sleep medicine. Chap. 40 dealing with evaluation and management of PLMS and RLS written by a leading authority on these topics is a new chapter in this edition but was included in the chapter on "Motor function and dysfunction of sleep" by Wayne Henning as the lead author in the third edition. The other three new chapters in this edition address Phylogeny of Sleep (Chap. 9), Sleep and Immune Regulation (Chap. 12), and Fatigue in Clinical Practice (Chap. 42). The chapter on the phylogeny of sleep is important to understand evolution of sleep from inframammalian to mammalian species which may help understand the function of and need for sleep. The role of sleep in immune regulation and fatigue, noted in many neurological and other conditions, and often mistaken for sleep or secondary to sleep deprivation is included in two new chapters in this edition. REM behavior disorder (RBD) is addressed as part of parasomnia chapter (no. 50), but in this edition, I have also included RBD as a separate chapter (no. 49) because of its increasing recognition as a forerunner to a neurodegenerative disease and the exciting possibilities of finding a biomarker for this. New authors and co-authors have been invited for several chapters (number 1, 4, 5, 6, 7, 8, 13, 14, 18, 23, 24, 28, 32, 34, 38, 39, 41, 44, and 54). Clifford Saper, a leading neuroscientist and researcher in basic science of sleep, replaced William Dement in writing the introductory chapter (no. 1). For the circadian timing and sleep-wake regulation chapter (6), Philip Boudreau and co-authors replaced Robert Y. Moore. For Chap. 14 (Dreaming and Sleep Disorder), James. F. Pagel and Seithikurippu R. Pandi-Perumal replaced Rosalind Cartwright.

The basic layout of the fourth edition remains same as in the third edition, dividing the book into three major sections: basic science, technical considerations, and clinical aspects. However, because of increased size of this edition to conform to the policy of Springer, the fourth edition of the book is published in two volumes (volume one dealing with basic science and technical aspects and volume two dealing with clinical consideration). As in the third edition, the purpose of this edition remains the same, namely to provide a comprehensive text for both the beginners and seasoned practitioners of sleep medicine. Hence, the book is directed at neurologists, internists (especially those specializing in pulmonary, cardiovascular, gastrointestinal, and renal and endocrine medicine), family physicians, pediatricians, psychiatrists, psychologists, otolaryngologists, dentists, neurosurgeons, neuroscientists, and intensivists, as well as those interested in advancing their knowledge in sleep and its disorders (e.g., technologists, nurses, and other healthcare professionals).

I end this preface by announcing with heavy heart and profound sadness the death of three giants in contemporary sleep medicine since the publication of the third edition, Professor Elio Lugaresi, Professor Pasquale Montagna, and Professor Arthur Spielman. These three distinguished scholars made robust scientific contributions in sleep medicine and sleep science. Their scholarly contributions left indelible marks in the scientific world. I dedicate this book to these three gentlemen and scholars. Their memory will remain forever with us. They are not physically present today, but their souls are indestructible, unvanquished, and eternal. May they rest in peace. We shall never forget what they have done as living mortals to promote sleep science.

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