

to bring forth thought-provoking inferences that will be useful for future research in insect-plant interactions.

I must confess that the chapter on 'Natural weed control in the Holarctic region and in the Tropics' appeared to be out of place, though no information in insect-plant relationships should be considered as unimportant.

In summary, the book has substantial information on insect-plant relationships with a particular stress on various aspects of plant feeding by insects. All the chapters are well referenced up to 1996. The glossary given at the end of the book should be very useful for graduate students. Scientists and professionals interested in insect-plant interactions and their behavioural biology would find this volume immensely valuable.

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**Rapid Eye Movement Sleep.** B. N. Mallick and D. Inoue (eds). Narosa Publishing House, 6, Community Centre, Panchsheel Park, New Delhi 110 017. 1999. pp. 419. Price: Rs 1500.

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Biological rhythms of activity-rest cycles are assumed to be the behavioural reflections of light-darkness cycles of the physical environment of living systems. The rest cycle is known as sleep and its biological manifestation goes by the definition of slow-wave (SW) sleep. With the evolutionary expansion of the brain and the emergence of neocortex, REM (rapid eye movement) state has been juxtaposed within the slow-wave sleep. Therefore, one tends to conjecture that this REM penetration was essential as partial freedom from strict diurnal cycles of environment. The book *Rapid Eye Movement Sleep* is a substantial contribution of eminent scientists. It attempts to throw light on the mysterious state of consciousness, which has been grossly over-interpreted as a dream state. While there are many

hypotheses, there has been no substantial understanding of REM phenomenon. The research is mainly focused on neuronal mapping or collection of correlated cellular events near the Locus Ceruleus, Pontine-tegmentum (Mesencephalic Reticular Formation) or as far as in thalamus, hypothalamus or farthest in the neocortex. However, this high frequency electroencephalographic (EEG) activity along with rhythmic and phasic Electrooculographic (EOG) activity is now accepted as a state of consciousness occurring during normal sleep or in patients with narcolepsy.

It may be reiterated that the REM sleep is emerged during the evolutionary stage of neo-cortical development in mammals. Undoubtedly the sleep mechanism in sub-primates is more hardwired than that in man. The experimental results contained in the book mainly focus on animal sleep. These results, therefore, may not be directly extrapolated to human beings. The REM sleep is still a mere phenomenological description of a state of consciousness. The classical structure-function approach helps us in visualizing and deciphering partial information about REM. It is not yet clear how visual imageries (dreams) are linked to REM. Only in a controlled environment, the REM is identical from night to night, even though there are penetrations of triggers from the environment. But in total isolation, the free-moving biological rhythms tend to become chaotic. This necessitates long duration of recording for several days and some heuristic analytical methods for any understanding of REM. Even though the title of the book is *Rapid Eye Movement Sleep*, it contains more details on SW sleep and EEG rather than on REM physiology. This is well exemplified in the opening note by the celebrated hypnologist Jouvet. However, the book serves as a compiled source of biological information on sleep, which is of interest to researchers in this field.

The sequences of chapters take a reader from one aspect to another with ease. Therefore, this contributory volume has the appeal of an introductory textbook on the subject. There are only a few laboratories working in this field and the editors have achieved a significant and meaningful compilation for the benefits of students and beginners in

sleep research. The first 12 chapters deal with known information on various neural and neurochemical substrates associated with sleep and REM. Even though these have been described in the past, their inclusion in the first part of this book serves the purpose of orienting the beginners to the core issues on the biological role and neural substrates involved in REM. A major paradigm shift is documented in these chapters in which the biology of REM has moved from brainstem to meso-pontine tegmentum. However, strictly speaking, the neural architecture of the central activating axis is dependent on the animal under study. All that we visualize in the new paradigm is a phylogenetic organizational principle of the brain.

There are a few minor difficulties in subsequent chapters as they fail to achieve the desired goal of the objectives of their respective topics. This is apparent so when the researchers consciously interpret the experimental findings of REM to an intrinsic survival mechanism. At both technical and analytical levels, there are some fit-falls in a few of the chapters. These are not serious and may be ignored by a prudent reader. The students of biology may not differentiate the facts from fiction like the terms 'spatio-temporal distribution', when the dipole tracing of multi-channel EEG data itself can be spurious. The locus of the dipole is equation dependent and it should not be interpreted as a localizing source for REM. Similarly, the paraphrasing of 'physiological properties of two population of neurons' is ambiguous. It is unlikely that the membrane properties of cholinergic neurons, that too only present in the brain, are different from other neurons. The concept of 'the possibility of broad spiking' is again an example, which should be understood in relation to integration of cellular conductance and not otherwise. It may be presumed that the terms used in this book may carry different meanings in the context of neurophysiology than that is generally understood in molecular biophysics. A serious look into some chapters like 'function of foetal/neonatal REM sleep', or chapter on 'REM deprivation' may, in fact, confound a reader as to meaning of REM process itself as it associates with a state where it may not occur. In fact, the possibility of REM in neonates

## BOOK REVIEWS

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is doubtful. It would have been a delight, if one would have been provided with some additional information on neonatal sleep patterns and brain maturation by citing known neonates with brain defects where maturation is slow or arrested. On the contrary, one may hypothesize that sleep in neonates is amorphous with little architecture or structure. The term REM may not carry much weight when one evaluates these results rigorously. The cellular and biochemical properties of the brain at neonatal stage of maturation are understandably of paramount importance, than the occurrence of REM.

One finds a small but significant addition on hormones in this book, which carries a substantial implication for the future in terms of stress management and REM. Many other chapters like any biology books are self-explanatory from their titles. This 'cellular and molecular changes' falls far short of the expectation of molecular biology. Significantly one may find the inclusion of a chapter on neurodynamics. It shows how a simple mathematical tool like  $1/f$  spectrum can carry deep meaning in terms of sleep phenomena. This chapter also includes a realistic artificial neural network model of  $1/f$  phenomena. Even though the chapter does not meet the

critical threshold of research on non-linear dynamics and brain processes, it carries immense value for analytical and modelling approach to brain.

In total the book is satisfying in its content and depth. The reference is fairly up to date. One may not have any hesitation in recommending the book for doctoral students and researchers in sleep physiology.

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