

Book Reviews

AFFECTIVE NEUROSCIENCE, THE FOUNDATIONS OF HUMAN AND ANIMAL EMOTIONS. 1998. By Jaak Panksepp. Published by Oxford University Press, New York. 466 pages. \$C105.00 approx

Jaak Panksepp has produced a volume that deserves to be on the reference shelf of any psychiatrist, behavioural neurologist, psychologist and neuroscientist who believes, as he does, that the fundamental building blocks of complex behaviour have neurological origins reflected in specific neuroanatomies and neurochemistries.

Panksepp christens this new scientific perspective, "Affective Neuroscience" which focuses upon the neurological basis of the emotional operating systems of the mammalian brain and the various conscious and unconscious internal states that these systems generate. Panksepp's aim was to write a book for students. The book, because of the complexity of the subject matter, is best appreciated by individuals who are already immersed in neuroscience with foundational knowledge in neuroanatomy, neurochemistry, behaviour and psychology. For these individuals this book will shed new light as it integrates decades of animal research with contemporary psychological concepts. For clinicians in particular, the described neurobiological systems with their behavioral correlations will challenge old assumptions and lead to novel ways of thinking about the neurological origin of their patients' disturbed behavior.

Panksepp describes the basic drives and emotional systems that provide the scaffold for all behavior. These systems arise out of the more primitive subcortical structures especially the upper brainstem and diencephalon. The best brain behaviour correlations for these systems are derived from animal research models. It is immediately obvious that Panksepp has spent many years considering these issues. The reader is the beneficiary of these insights and the conceptual integrations that he brings to this complex area. Of particular relevance to clinicians is the value of cross-species comparisons when attempting to understand the neurobiology of drives and emotions. Animal observations about these systems is likely to be highly relevant in understanding human behavior because of the cross-species conservation of the ancient brain structures that subserve these functions. As pointed out by Panksepp, a cross-species approach to the understanding of basic behaviors is more likely to reveal general principles of brain function than a comparative study attempting to grasp higher order behavior such as intellect, cognition and executive function.

Panksepp takes the liberty of labeling the major drive and emotional systems in folk psychological terms. This is both good and bad. Most of the labels that he utilizes capture the essence of the system described. This is not, however, true for all. For example, his PANIC system would be better described as the BONDING system to distinguish it from his FEAR system and the kind of anguish, namely sadness that arises when this system is threatened by loss of any kind but especially the loss of a significant personal attachment.

The initial chapters provide an overview of brain neuroanatomy and neurochemistry with sections on *in vitro* techniques such as tracer labeling and auto-radiographic studies and the newer *in vivo*

technologies such as Positron Emission Tomography, functional MRI and MRI Spectroscopy. Panksepp makes the point that these neuroimaging techniques have shown changes in cortical regions rather than in the brainstem and contiguous diencephalon, the very locations that have been identified as the source of emotional organization in animals. This is due to the fact that these techniques are not effective in detecting changes in compact brain, such as the brainstem, where functionally opposing circuits are small and closely interwoven.

Most of these animal experiments have been done on rats. Thus the rat brain anatomy appears throughout the book. For those readers who like me, have only worked with humans, a much more detailed exposition of rat brain anatomy with cross correlations to human neuroanatomy would have been helpful.

Panksepp uses MacLean's triune brain concept as a way to conceptualize the brain's overall organization. The triune brain consists of three layers. Firstly, an ancient reptilian brain reflected in the basal ganglia and responsible for basic motor behaviours. Secondly, a more recent old-mammalian brain reflected in the limbic system and responsible for mammalian emotional tendencies. Lastly, a neomammalian brain consisting of mostly neocortex which elaborates the cognitive/rational aspects of behaviour.

The final common pathway of output from the triune brain converges upon the periaqueductal grey which lies ventral to the corpora quadrigemina. The periaqueductal grey contains the basic circuits for many emotional processes while the superior colliculus, although primarily processing visual information also processes both auditory and somatosensory space information as well as exercises motor control. Hence it is an elementary multimodal area. This is a point to which Panksepp returns at the conclusion of his book as it is here that he locates the primordial self.

Panksepp provides an overview of the most important neurotransmitters and neurotransmitter pathways emphasizing the many neuropeptides that have been discovered. The neuropeptides appear to provide specific control over basic psychological functions such as appetite, stress and discrete emotions. By contrast, the neurotransmitters such as acetylcholine, norepinephrine, dopamine and serotonin tend to have more general functions to do with attention and arousal (acetylcholine, norepinephrine and dopamine) and behavioural inhibition (serotonin). The neuropeptides, despite their promise of revealing neurochemical-behavioural correlations, are difficult to study because they cannot be manipulated by peripheral means. Peptides, like other proteins, are degraded in the stomach and liver and cannot enter the brain intact. Those that manage to enter the bloodstream rarely pass through the blood brain barrier.

A chapter is devoted to defining emotions. This has never been an easy problem. And it is not resolved by Panksepp. A typical list of core emotions consists of anger, fear, sadness and pleasure. Fear and anger arise from activation of the FEAR and RAGE system respectively. Pleasure is a function of the SEEKING system emerging as a byproduct of consummatory behavior while sadness is the endpoint of activation of the PANIC or separation distress system. Panksepp's systems include a LUST system, a CARE system and a PLAY system. There are also chapters on the neuroanatomy and the neurochemistry of sleep and energy

homeostasis. Thus, the book describes the neurobiology of fundamental behaviours which are a combination of drives (a need state indicative of the presence of a regulatory imbalance) and emotions (raw feeling states).

Panksepp reviews the animal data for each of these emotional and drive systems starting with the relevant neuroanatomy and neurochemistry. Behavioral correlations are intermeshed. These descriptions are followed by attempts to link disturbances in each system to clinical psychiatric conditions. For the clinician, some of Panksepp's clinical inferences, although plausible, will simply not ring true. Each chapter concludes with an afterthought containing speculative leaps as well as philosophical and sociopolitical musings. These afterthoughts and clinical correlations are provocative and are stimulating grist for the intellectual mill.

Panksepp concludes his book by taking a stab at consciousness. In the end what he describes is not subjective self-awareness (the ultimate mystery) but rather a primitive and primordial site of behavioural coherence and body awareness centered around the periaqueductal gray matter in the brainstem. This localized region serves as a central polysynaptic multimodal multi-option reflex center that integrates sensory and affective input to initiate coherent goal directed complex motor programs so as to achieve the goals of resource acquisition, reproduction and avoidance of harm in a competitive interorganismic world. Swimming upstream against contemporary intellectual trends, Panksepp believes in the presence of a central processor that must underpin any description of consciousness. Panksepp does not suggest that the brainstem region has the capacity to observe itself, only that such a region must be incorporated into any higher form of consciousness. Self-awareness, the highest level of consciousness remains unexplained, reasserting its claim to be one of the most, if not the most, perplexing, challenging and irresistible questions in neuroscience.

Affective Neuroscience is not an easy read. Nonetheless it synthesizes the most important animal work relating to the basic building blocks of behaviour. Mastering the information is worth the intellectual effort. It is an invaluable reference for any neuroscientist interested in understanding the neurobiological basis of drives and emotions where the best information is contained in the animal literature. This is the strength of Panksepp's book which summarises and references these data around clinically recognizable concepts making the information highly relevant to practising clinicians.

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MOLECULAR AND CELLULAR NEUROBIOLOGY; CORTICAL PLASTICITY LTP AND LTD. 1998. Edited by M.S. Fazeli and G.L. Collingridge, Ontario: Oxford University Press Canada. 253 pages. ill. C\$108.00

This book includes 25 contributors, the majority of which are from the United Kingdom. The book reviews the current concepts of molecular biology in cortical plasticity in 11 chapters. The emphasis is on studies in long term potentiation (LTP) and long term depression (LTD). These processes are believed to modify synaptic properties in the cerebral cortex and contribute to learning of new patterns of behavior.

The reader needs to be equipped with background knowledge on

the mechanisms of various neurotransmitters at a synaptic level, as well as secondary messengers and gene expression. Chapter 2 lists the amino acid receptors of interest for LTP and LTD, including glutamate and GABA receptors. There is no summary at the end of the chapter to help readers develop a clearer concept, and it is likely that they will be left with a platter of loose data with no conclusions drawn as to the relative significance of these receptors. A similar comment may be applied to the chapter on secondary messengers. A conclusion similar to that in Chapter 4, would be much appreciated. Chapters 5 and 6 are somewhat repetitive and would have been better combined into one chapter. The clinical applications of such knowledge has been linked to epileptogenesis. There is, however, no direct implications for human learning processes and behavioral modeling despite the abundant data on synaptic plasticity in the hippocampus, visual cortex, and neocortical areas. Chapter 11 attempts to propose models of learning and association with mathematical expressions. These models are embryonic in their development and are far from being validated.

In summary, this book is well written with helpful illustrations. It contains valuable information on research carried out over the past 25 years and is very focused in the subjects of LTP and LTD. It is an important source of references for basic neuroscientists interested in studying the mechanisms of learning and behavior.

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THE CNS IN ACTION THE GUSTATORY SYSTEM #4. 1999 By Dr. Louise Charron, Dr. Jean-Marie Peyronnard. Published by SSB Multimedia Health Sciences. CD ROM media C\$133.00 approx.

This is an excellent learning aid to the study of the anatomy, gross and detailed, as well as the neurobiology of taste. Although the anatomy is supposed to be "functional" it is presented in sufficient detail to more than satisfy the basic needs of most neuroanatomy professors. In fact, for practicing neurologists, the detail provided here is more than would ever be desired or needed. It would be a great learning resource for housestaff in neurology, neurosurgery or ENT specialties. Skull based surgeons may find parts of it useful as a good review although this is not surgical anatomy. The neuroanatomy of gustation is complex and difficult to learn but can be rewarding if understood, and this multimedia presentation makes it easy to follow and learn.

The neurobiology is well presented, from cellular events to a detailed analysis of receptor cell types and their functions, along with the local and central connections for gustation. Our gustatory systems are very interesting and highly evolved and this is an ongoing area of study for biomedical research. It is informative to learn how "unique sensory receptors" turn "feeding activities" into "gastronomical feasts!", as the authors point out in the booklet that accompanies the CD.

It is an easy CD to use, it boots up quickly on computers with the newer faster processors, and it has an intuitive interface, a good index and help section. It presents the topics in small "video movies" which is accompanied by a verbal commentary. The voice can be shut off as it simply reiterates the text. Some of the movies could be shorter or there should be an advance