

## Book Reviews

*The EEG of Mental Activities*. (1988). (Eds D. Giannitrapani and L. Murri), Karger, Basel.

The book is based on papers presented at a symposium held in Viareggio during June 1986. However all the text has been reviewed and updated to reflect the "state of the art" at the time of publication in 1988. Each paper contains an extensive review of the relevant literature with appropriate bibliography as well as an account of some personal contribution to the field by the author or authors. This format makes the volume valuable as a work of reference but does not make for easy reading.

The most obvious feature of the recordings of electrical potential obtained from the surface of the scalp that we know as the "EEG" is the presence of more or less rhythmic oscillations, the most prominent usually about 10 per second, preferentially recorded from the occipital scalp, and other oscillations often about twice this rate, most marked towards the mid-line and frontal regions.

That these "rhythms" are closely related to the functioning of the brain is now almost universally accepted. They are usually disturbed in a fairly obvious way by gross lesions of the brain and they clearly reflect changes of conscious level as in sleep or coma. There is potential too for recognizing more subtle alterations of mental state as in alerting, attentiveness and boredom. The areas addressed in this book are even more subtle: dementia, the extent to which the right and left hemispheres play differing roles in cognition, and the possibility of using the EEG to aid in delineating the physical signs of psychopathology.

The first paper by Zappoli and part of the paper by Angeleri *et al.* concern evoked potential techniques, but the general thrust of the papers in this book concerns measurements of the amplitude or power of averages of quite long periods derived by the method of Fourier analysis. It is of interest that almost every paper acknowledges the methodological difficulties of this approach. For example the comment by Butler "... that the alpha rhythm becomes asymmetric during the performance of certain tasks, that the direction of this asymmetry appears to reflect the underlying lateralization of brain functions, but that the effect is not consistent enough to reveal hemispheric specialization in a reliable manner."

Most of the studies described here are "classical" in that they address the well known frequency bands alpha, beta, delta, theta and estimate the amplitude changes, absolute or relative, associated with various tasks. An interesting observation is however made in Giannitrapani and Collins' contribution concerning Alzheimer's disease which seems to be characterized by "an exponential curve decreasing in power with increasing frequency" and the authors point out that measurements using traditional broad band EEG frequencies would fail to reveal this effect.

Murri *et al.* clearly set out the fundamental assumptions underlying studies of this kind: "The first is that *mental activity is accompanied by reduction in the signal* (usually in the alpha band), and that when this occurs asymmetrically during a cognitive process, it indicates differences in hemispheric involvement in the performance of the particular task . . . The second supposition is that in right-hand subjects, verbal and analytical-type activities (e.g. reading, writing, classifying, etc.) mainly involve the left hemisphere, whereas tasks of a nonverbal, spatial, holistic and musical type imply a prevalent right hemisphere involvement, independent from differences amongst these individual tasks."

Even these fairly simplistic criteria are by no means consistently applicable. Later, for example, we find Flor-Henry proposing what appears to be the opposite view. "In the resting state lithium was associated with a significant *increase* in right parietal power . . . these EEG events *implied an activation* of neural systems in the right hemisphere."

A most interesting study by Inouye *et al.* provides the illustration for the cover of the book. The paper is concerned with "frontal mid-line theta" a phenomenon which should be known to all practising electroencephalographers but which seems only to have been studied in detail by workers in Japan. Careful investigation using the techniques of spectral, cross-spectral and bi-spectral analyses together with topographic and chronotopographic displays is used to elucidate the details of this well known but little studied phenomenon. We note with interest "It therefore seems that the active performance of a mental task is likely to induce [frontal midline theta] . . .".

The publisher's choice of an illustration from this paper for the cover of the book, while probably made for purely artistic reasons, could also be considered as a well deserved tribute to one of the best papers of this collection.

A second contribution by Giannitrapani "The role of 13-Hz activity in mentation" briefly summarizes his search for a rhythm in the EEG which would correlate with IQ. This seems to have been inspired by disillusion with the inconsistencies found when trying to relate mental activity with the alpha rhythm. The most revealing comment is probably "a function as hierarchically complex and phylogenetically recent as intelligence, however, should not be expected to be mediated by a unidimensional structure such as a single frequency band."

Even more divorced from the mainstream of EEG experience is the contribution from DeFrance and Sheer "Focused arousal, 40-Hz EEG, and motor programming". I cannot judge the technical validity of these studies without personal experience of such recordings but at least it is a good sign that the authors are aware that "There are serious problems encountered in trying to reliably record short aperiodic bursts of 40 Hz from the human scalp". I am also worried by the interpretation which seems to build a considerable structure of hypotheses upon rather slender foundations.

DeFrance and Sheer are clearly impressed by the work of Freeman at UCLA but I worry about the approach "We can generalize the neural mechanisms beyond the olfactory bulb without, of course, the elegant detail

that Freeman has worked out for the bulb. Spatial amplitude patterns of coherent oscillations are determined by unique templates of synaptic connections, forming – with focusing behavioral operations such as reinforcement contingencies – distinctive nerve cell assemblies for discriminative information”.

The final two contributions are on the eternally controversial subject of schizophrenia. Again any competent electroencephalographer will recognize the disruption of the EEG rhythms which occurs in acute schizophrenia and the frequent finding of a well defined stable and often rather slow alpha rhythm in chronic schizophrenia. Beyond this point the picture is confused but perhaps it is well summed up by the following quotation from Kemali *et al.* “So far, EEG contributions to the generation of hypotheses concerning the pathogenetic mechanisms underlying schizophrenic disorders are not irrelevant.”

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