

S-182-777 A New Paradigm for Research with Hallucinogens*Stephen Szára**SIS Research Consulting, 10901 Jolly Way, Kensington, MD 20895*

Hallucinogens, or psychedelic drugs have some unique psychological effects the most prominent of them is the extension or loss of ego boundaries with the associated feeling states for which no satisfactory neurobiological explanation is known. Since the establishment of ego boundaries is an important aspect of the development of the self in children, and its pathological disturbance in psychotic states is an important source of a range of symptoms, it would appear to be of great heuristic value to explore the mechanisms by which LSD, DMT and other similar substances can elicit such unique effects. Much of the recent research focus had been on the role of 5HT₂ receptors but results indicate that this is not the whole story. Once the drug acts on serotonin receptors in certain areas in the brain, a cascade of chemical and physiological events are set in motion eventually resulting in psychological experiences just mentioned. What these events are is essentially unknown.

To facilitate further research in psychopharmacology and in particular with hallucinogens, a new framework (paradigm) is proposed for visualizing the cascade of events from receptors to ego-expansion, utilizing projective geometric and parallel multi-computer concepts.

(1) The cortex may be seen as an immense set of processors (neurons) that are interconnected by multiple lines (axons) terminating mostly on other processors with junctions (synapses). These junctions are using essentially all-or-none activating functions but their thresholds can be biased (modulated) in a graded fashion by aminergic afferents.

(2) The cortex is also known to be divided into several cytochemically distinct fields and their connecting links with each other are postulated to be operated by rules defined by the fundamental theorem of projective geometry (Pappus theorem). Thus the cortex can be considered as an immense multi-computer using parallel asynchronous communication links.

(3) Several of the subcortical aminergic systems are known to project extensively to many areas of the cerebral cortex, the hippocampus and to other subcortical areas. They may be seen as providing a sequential executive organizer (operating system) for the cortical "parallel computer".

(4) The noradrenergic locus coeruleus, the serotonergic raphe, the dopaminergic substantia nigra and ventral tegmental area, and the cholinergic nucleus basalis (and possibly several others) are also known to interact with each other as well as receiving feedback from the cortex. These recurrent, dynamic interactions may be seen as providing the biological basis (mostly through the process of attention) for the subjective experience of the unitary nature of consciousness.

(5) Many of the central concepts developed for concurrent programming of parallel computers, such as critical region (kernel), semaphore, monitor, rendezvous, deadlock, resource allocation etc could be viewed as analogs of certain specific aspects of subjective experience. For our immediate concern consider that the "critical region" can be seen as the biological substrate for the selective attention process, and the "semaphores" can be viewed as the internally set boundaries that normally define the subjective limits of the self. Hallucinogens are seen, in this conceptualization, as removing the semaphores by interacting with the neurobiological mechanism that imposes these boundaries.

(6) Such a conceptual framework could provide a rich source of hypotheses at several distinct levels of scientific inquiry ranging from the molecular to the psychosocial ones. These studies should provide insight into the mechanisms of complex drug-induced or drug-sensitive psychological and experiential phenomena with important theoretical and practical implications.