

Reviews

A tribute to W.R. Hess (1881–1973)

Prologue

Last year we celebrated the 100th anniversary of the birth of Walter Rudolf Hess, Professor of Physiology at the University of Zürich, researcher in and teacher of neurophysiology, Nobel Laureate, and one of the founders and strongest exponents of *integrative* neurobiology. A symposium held in Zürich to mark the occasion gave those present the pleasure of listening to a number of papers in which some of Hess' former collaborators and pupils as well as some outstanding neurobiologists in their own right reflected on the achievements of the man whose so multifaceted work has influenced the research of an uncountable number of neuroscientists, and investigators in a variety of other fields including circulatory and respiratory physiology.

For the majority of readers, Hess' name immediately brings to mind his *Functional Organization of the Vegetative Nervous System*, an extended series of experimental and analytical papers and books in which he described those principles of integration which underlie the single aim of an organism's many autonomic functions: the preservation of internal well-being at minimal energetic cost. It was mainly on the basis of his earlier work on circulation and respiration that Hess could develop integrative interpretations.

Another important although somewhat less well known aspect of Hess' investigations and analytical considerations concerned the organization – the neural control – of biomotor activity. As was the case in his work on the organization of the vegetative system, Hess' research on the organization of biomotor activity was made possible because of knowledge he gained from studies on a peripheral model; in this case, the model used was the eye. As a trained – and at times practising – ophthalmologist, he investigated intensively the activities of the various eye muscles that allow precise positioning of the eyeball and, thus, assure proper vision.

A third field where Hess' probing research exerted, and still exerts, a strong impact is in the *Physiology of Sleep*. As early as 1924–1925, he postulated the existence of the 'vegetative innervation' and control of the cerebral cortex by subcortical structures and thus laid the groundwork for his hypothesis of the active nature of sleep – a notion which was later corroborated when he showed that in the experimental animal sleep can be induced by electrical stimulation of the thalamus. Hess' idea of the active, controlling innervation of the cortex was put to test and proven by Moruzzi and Magoun's famous experiment involving stimulation of the reticular formation. More recently, the notion of the 'vegetative nature' of this innervation found additional support through the discovery of the diffuse and highly diverging adrenergic, dopaminergic, cholinergic and serotonergic projections – all 'wet' transmitters – from brain stem sites to the hemispheres. Hess' seminal work also gave rise to modern analysis and interpretations of what one may properly term the 'state of vigilance' in higher functions.

Hess was one of the first to stress the neurophysiological background of behavior, the space-intensity-time pattern – his 'Dispositiv' – of nervous activity, as the necessary and sufficient basis of whatever we do, feel, or think. He produced some of the first evidence emphasizing the importance of the limbic system in the organization of affective behavior; these notions are indispensable today to all those dealing with biological psychiatry.

Experientia's own tribute to Walter Rudolf Hess closely follows the centennial celebrations. The authors of this present collection of papers do not all share the same ties to Hess – some are speakers who took part in the 1981 Zürich symposium, others are former pupils of the scientist, and still others are investigators upon whose work Hess' theories have had great bearing. It is precisely for this reason that their papers form a worthy homage to this great Swiss scientist for they consider not only the scope of Hess' distinguished achievements, they give testimony to the undiminished import Hess' research holds for work done in neurobiology today.

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