

**PROGRESS
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Volume 22

BRAIN REFLEXES

edited by **E. A. Asratyan**

PROGRESS IN BRAIN RESEARCH
VOLUME 22

BRAIN REFLEXES

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the publication of I. M. Sechenov's book *Brain Reflexes*

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Preface

This book contains research reports and review articles given at an interdisciplinary international meeting in Moscow. This book is a follow-up of the first volume of this series (titled *Brain Mechanisms*) and was sponsored by the International Brain Research Organization and the USSR Academy of Sciences.

The meeting was dedicated to the century celebration of Sechenov's book *Brain Reflexes*. It therefore illustrates the tremendous increase in our field since the publication of the famous book.

In order to give an overall review of the main aspects of the brain sciences the following three symposiums were being held:

- (a) "Brain reflexes" and central inhibition;
- (b) General principles of self-regulation in cortico-subcortical correlations;
- (c) Evolutionary physiology of the nervous system and brain ontogenesis.

It was expected that this book will serve as a guide to classical and modern Soviet neurophysiologists.

The Editor

1st Symposium

“Brain Reflexes” and Central Inhibition

2nd Symposium

General Principles of Self-regulation in Cortico-subcortical Correlations

3rd Symposium

Evolutionary Physiology of the Nervous System and Brain Ontogenesis

Contents

List of Contributors	v
Preface	xi
I. "BRAIN REFLEXES" AND CENTRAL INHIBITION	
Central inhibition of reflexes and the problem of the coupled activity of cerebral hemispheres K. S. Abuladze (Moscow, U.S.S.R.)	3
Some peculiarities of formation, function and inhibition of conditioned reflexes with two-way connections E. A. Asratyan (Moscow, U.S.S.R.)	8
Central inhibition according to I. M. Sechenov's experiments and concepts, and its modern interpretation I. S. Beritov (Tbilisi, U.S.S.R.)	21
Resting saliva of men as a reflex T. Hayashi and R. Suhara (Tokyo, Japan)	32
On the central inhibiting mechanism of the thalamic suppression of spinal motor reflexes P. A. Kiselyev (Leningrad, U.S.S.R.)	45
Inhibition of nerve cells and nerve centres A. B. Kogan (Rostov-Don, U.S.S.R.)	55
Synaptic mechanism of central inhibition P. G. Kostyuk (Kiev, U.S.S.R.)	67
Inhibition in neural systems of the cerebral cortex M. N. Livanov (Moscow, U.S.S.R.)	86
On the structural mechanisms of functional states in neurons of the cerebral cortex G. I. Polyakov (Moscow, U.S.S.R.)	98
Role of synaptic inhibition in synchronization of thalamo-cortical activity D. P. Purpura (New York, N.Y., U.S.A.)	107
Slow surface-negative potentials of the cortex and cortical inhibition A. I. Roitbak (Tbilisi, U.S.S.R.)	123
Basic (alpha) EEG rhythm as electrographic manifestation of preventive inhibition of brain structures P. V. Simonov (Moscow, U.S.S.R.)	138
The possible histological basis of inhibition J. Szentágothai (Budapest, Hungary)	148
The frequency response of horizontal pursuit movements of the human eye and the influence of alcohol H. Drischel (Leipzig, D.D.R.)	161
Concept of the conditioned reflex in the light of instrumental reactions D. G. Martin (Havana, Cuba)	175
Relations between behaviour in dogs and electrical activities in various parts of the brain W. Storm van Leeuwen, A. Kamp, M. L. Kok and A. M. Tielen (Utrecht, The Netherlands)	181

Reflex and brain stem inhibition of sham rage behaviour A. Zanchetti (Siena, Italy)	195
Average evoked responses to somatic stimulation in the cat: changes in relation to state of vigilance D. Albe-Fessard, J. Massion, R. D. Hall and W. A. Rosenblith (Paris, France and Cambridge, Mass., U.S.A.)	206

2. GENERAL PRINCIPLES OF SELF-REGULATION IN CORTICO-SUBCORTICAL CORRELATIONS

Conditioned reflex and the problem of thalamo-cortical interrelations O. S. Adrianov (Moscow, U.S.S.R.)	219
Nodular mechanism of functional systems as a self-regulating apparatus P. K. Anokhin (Moscow, U.S.S.R.)	230
A modern interpretation of the mechanism of I. M. Sechenov's psychical reflex medium member I. S. Beritashvili (Tbilisi, U.S.S.R.)	252
A cortico-subcortical system controlling differentiation ability S. Brutkowski (Warsaw and Lodz, Poland)	265
The role of the amygdaloid nucleus in animal behaviour E. Fonberg (Warsaw, Poland)	273
Pseudo-affective reflexes of cats produced by extracts from the plant <i>Actinidia polygama</i> T. Hayashi (Tokyo, Japan)	282
Effects of activation systems on neocortical after-discharges A. Kreindler, E. Crighel and M. Steriade (Bucharest, Rumania)	286
The role of the meso-diencephalic activating system in higher nervous activity: its role in habituation, learning mechanisms and conditioned reflex processes K. Lissák and E. Endröczy (Pécs, Hungary)	297
Cortical modulation of transmission of the afferent volley through the lateral geniculate body R. M. Meschersky (Moscow, U.S.S.R.)	312
Cortical inhibition of thalamic relay nuclei S. Narikashvili and D. Kadjaia (Tbilisi, U.S.S.R.)	340
Mécanismes d'autorégulation dans les corrélations cortico-souscorticales O. Sager (Boucares, Roumanie)	353
The contingent-negative variation: an electro-cortical sign of sensori-motor reflex association in man W. Grey Walter (Bristol, Great Britain)	364
Spreading depression and cortico-subcortical interrelations in the mechanism of conditioned reflexes J. Bureš and O. Burešová (Prague, Czechoslovakia)	378
Peripheral and central modulation of visual input during 'habituation' A. Fernández-Guardiola, A. Toro Donoso, J. Aquino Cias and E. Guma Diaz (Havana, Cuba)	388

3. EVOLUTIONARY PHYSIOLOGY OF THE NERVOUS SYSTEM AND BRAIN ONTOGENESIS

I. M. Sechenov and some problems on evolution of nervous activity D. A. Biryukov (Leningrad, U.S.S.R.)	403
Electrophysiological signs of hippocampal development in ontogenesis N. N. Dzidzishvili and L. R. Kvirkvelia (Tbilisi, U.S.S.R.)	414
On the evolution of the integrative activity of the central nervous system in the phylogeny of vertebrates A. I. Karamyan (Moscow, U.S.S.R.)	427

Age and seasonal differences in the effects of some neurotropic substances V. Petkov (Sofia, Bulgaria)	448
Modification of ontogenetic patterns in mammalian brain D. P. Purpura and R. J. Shofer (New York, N. Y., U.S.A.)	458
Electrophysiological aspects of cortical development J. Scherrer (Paris, France)	480
Evolution of neuro-humoral regulation of the excitation in interneuronal synapses during ontogeny V. S. Sheveleva (Leningrad, U.S.S.R.)	490
Unconditioned reflex as specific character and problem of studying instinct A. D. Slonim (Leningrad, U.S.S.R.)	506
Some regularities in cellular and subcellular evolution of structure, chemism and function of sense organs I. A. Vinnikov (Leningrad, U.S.S.R.)	518
Comparative studies of the functional development of analyzer systems in animals in the process of ontogenesis A. A. Volokhov (Moscow, U.S.S.R.)	527
On the problem of the evolution of the vertebrate afferent systems L. G. Voronin, K. G. Gusselnikova, V. I. Gusselnikov and A. J. Supin (Moscow, U.S.S.R.)	541
Differentiation of metabolism in muscles of different function during ontogenesis E. Gutmann (Prague, Czechoslovakia)	566
Some problems of elaboration of a temporary connection in the prenatal period J. Sedláček (Prague, Czechoslovakia)	575
Author Index	585
Subject Index	593

'BRAIN REFLEXES' AND CENTRAL INHIBITION

Central Inhibition of Reflexes and the Problem of the Coupled Activity of Cerebral Hemispheres

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The fact that the process of inhibition appears in living tissue was first discovered experimentally by the Weber brothers. These authors observed that when the vagus nerve is excited with electric current, the heart ceases contracting. It was not long after this discovery that I. M. Sechenov attempted to prove the presence of inhibition centres in the regio thalamica by his famous experiment of 1862. Further experiments have made it clear that there are no special inhibiting formations in the central nervous system, but that the process of inhibition that occurs within it is always associated with the process of stimulation.

Sechenov's experiment played a great role in the development of physiology of the central nervous system, since it was the initial phase of systematic studies of central inhibition.

A century has passed since versatile and intensive studies of this process started, involving prominent physiologists, and yet the nature of inhibition, and its relation to the stimulation are far from fully discovered. Inhibition, in the broad meaning of the term, is understood to be complete temporary cessation or temporary suppression of the functioning of an individual organ or the whole organism. Proceeding from this definition, it is easy to understand the process of inhibition when drugs or other toxic agents are introduced, when inhibition results from exhaustion of the energy-producing material in a working organ, with fatigue or when there is no stimulation; on the other hand, inhibition is difficult to understand when it appears with complex co-ordinated movements. This act is known to alternate rapidly between excitation and inhibition within one and the same group of muscles, or both of them proceed simultaneously in different groups of muscles, which ensures well-co-ordinated movement. It remains obscure how this co-ordinated correlation between excitation and inhibition is actually exercised. Almost every author believes that inhibition is an innate process and always appears alongside excitation of any afferent nerve, but this assumption does not solve the problem of their correlation, for instance, when excitation may partly or completely displace inhibition from some organ, and *vice versa*.

The great physiologist I. P. Pavlov introduced a new productive idea into the theory of inhibition by his experiments with conditioned reflexes. He demonstrated that