Development of Complex Curricula for Molecular Bionics and Infobionics Programs within a consortial* framework**

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**Molekuláris bionika és Infobionika Szakok tananyagának komplex fejlesztése konzorciumi keretben

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BASICS OF NEUROBIOLOGY

Neurobiológia alapjai

QUO VADIS –NEUROBIOLOGY?

Quo vadis- Neurobiológia?

ZSOLT LIPOSITS

ARS POETICA

The complexity of components has reached a level, where their utilization overpasses the architectural capabilities of artificial systems developed so far and requires solutions applied also by nature.

The development of neurosciences and genetics have reached a level where the exactness of models allows us creating Neuromorphic or nature inspired systems and the application of the knowledge about our cognitive properties as a communicator and consumer of information becomes possible.

As a consequence of the "sensory revolution" cheap artificial sensing arrays and activating devices provide for acquiring an incredibly rich information base of the spatial-temporal reality that surround us, and at the same time require the immediate processing of millions of analogue signals.

The biomedical industry needs and uses the latest achievements of information technologies, including noninvasive imaging devices and systems, it also calls for the reliable interaction between electronics and living cells.

ARS POETICA

The limits of classical microelectronic components have been reached; the nanotechnologies have appeared in information processing both for artificial as well as for living systems.

The emergence of cheap, broadly used and global mobile telecommunication services enables the application of tele-presence in broad scale.

The expansion of the European Union and the globalization of division of labor increased the importance of human language technologies in the variety of languages. In order to face the above challenges our students need:

- a new structure of multidisciplinary studies
- a good theoretical formation via the effective application of information technologies
- specializations that are based on well founded theoretical knowledge
- a skill based training, included from the start of the program

SYNTHESIS OF LIFE SCIENCE DISCIPLINES

MATHEMATICS
PHYSICS
MICROELECTRONICS
INFORMATION TECHNOLOGY
COMPUTING
PROGRAMING

BIOCHEMISTRY
MOLECULAR BIOLOGY
NEUROBIOLOGY
NEURONAL NETWORKS
SYSTEM BIOLOGY
MODELLING

RECOMMENDED COURSES AND STUDIES

PhD studies

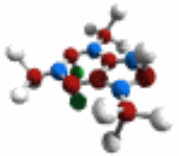
Diploma

IMMUNOLOGY, GENETICS

INTRODUCTION TO FUNCTIONAL NEUROBIOLOGY

BASICS OF NEUROBIOLOGY

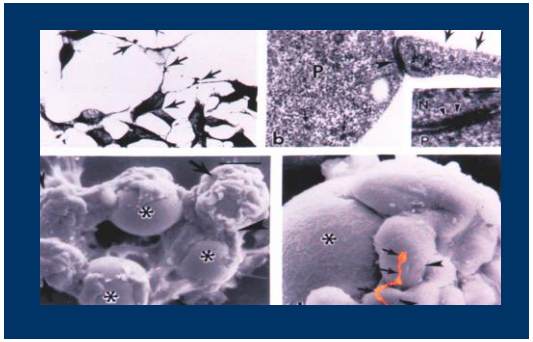
BIOPHYSICS, MOLECULAR BIOLOGY



LECTURES OF THE COURSE

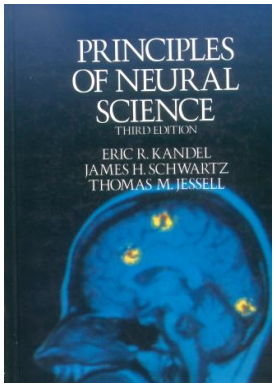
1. Quo vadis-Neurobiology?
2. Organ systems
3. Organization of the nervous systems
4. The cell
5. Cell organelles I.
6. Cell organelles II.
7. Nervous tissue
8. The neuron
9. Nerve fibers
10. The neuroglia
11. Nerve endings
12. Synaptic communication
13. Neurotransmitters I.
14. Neurotransmitters II.

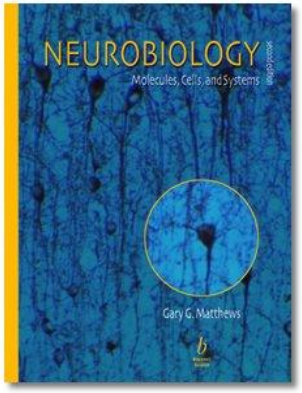
15. Release of neurotransmitters
16. Ionotropic receptors
17. Metabotropic receptors
18. Neurodegeneration
19. Development of the nervous system
20. Spinal cord
21. Internal structure of the spinal cord
22. Tracts of the spinal cord
23. Stretch reflex
24. The flexor and autonomic reflexes
25. Brain stem
26. Structure of cerebellum
27. Networking of cerebellum
28. Organization of the brain stem
29. Networking of brain stem

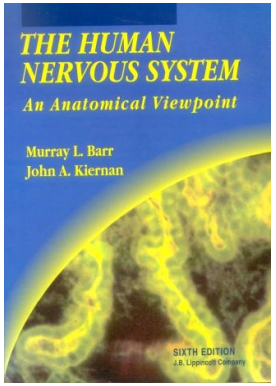


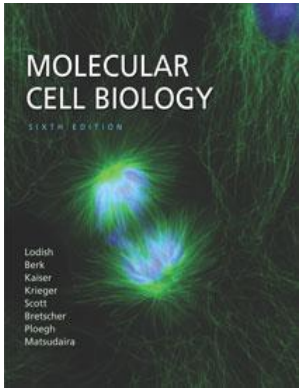
30. Cranial nerves
31. Diencephalon
32. Divisions of the telencephalon
33. Cytoarchitecture of cerebral cortex
34. Sensory systems
35. Motor systems
36. Hippocampal formation
37. Olfactory system
38. Visual system
39. Cochlear and vestibular systems

RECOMMENDED TEXTBOOKS









FINAL EXAM

1. Written exam at the end of the semester: max. 70 points
2. Written mid-term exam: max. 20 points
3. Activity at the practicals: max. 10 points

„Scientia et conscientia”

WAYS OF LEARNING

1. GENUINE INTEREST, HIGH MOTIVATION
2. ACTIVE PRESENCE AND PARTICIPATION
3. WORKING = LEARNING
4. CONTINUOUS LEARNING
5. ANALYSIS OF CAUSE AND ITS EFFECT
6. ABSTRACTION
7. REALIZE YOUR SCIENTIFIC DREAMS
8. RAISE QUESTIONS, WORK IN AN INTERACTIVE MANNER
9. BIOLOGICAL EVENTS ARE PLASTIC IN NATURE
10. STRUCTURE-FUNCTION-MODELLING-TRANSLATION-INNOVATION
11. 3D APPROACH AND PERSPECTIVE OF BIOLOGICAL STRUCTURES
12. LEARN FROM TEXTBOOKS AND USE PUBMED

CONTEMPERARY RESEARCH METHODS OF NEUROBIOLOGY

1. CLONING
2. GENETIC ENGINEERING
3. GENE EXPRESSION PROFILING
4. QUANTITATIVE REAL-TIME POLYMERASE CHAIN REACTION (PCR)
5. PROMOTER ASSAYS
6. DNA, RNA AND PROTEIN MEASUREMENTS
7. IMMUNOCYTOCHEMISTRY
8. CONFOCAL LASER MICROSCOPY
9. 2-PHOTON LASER MICROSCOPY
10. RADIOIMMUNOASSAY
11. PATCH CLAMP ELECTROPHYSIOLOGY
12. *IN VIVO* ELECTROPHYSIOLOGY
13. IMAGING AND RECONSTRUCTION TECHNIQUES
14. MONITORING OF BEHAVIOR