



ABSTRACTS

I. NEW FUNDAMENTAL KNOWLEDGE ABOUT BRAIN AND MIND AND THEIR IMPACT ON SCIENCE AND SOCIETY

Miloš Judaš
FROM DECADE OF THE BRAIN TO THE CENTURY OF MIND

The last decade of the 20th century was “The Decade of the Brain” and the 21st century has been announced as “The Century of the Mind”. This chapter reviews key contributions of *The Decade of the Brain* as well as major research goals in *The Century of the Mind*. The review focuses on: (1) the analysis of elementary components of the nervous system (molecules, cells, basic neuronal circuitry, signaling features of neurons, and mechanisms of nervous system development); (2) the analysis of mind and behavior and corresponding “large” neuronal systems and brain regions; and (3) perspectives and challenges for the 21st century – the problem of consciousness and the mind-body problem. Advancements and expected contributions of research on major neurological and mental disorders are emphasized.

Key words: neuroscience, neuroimaging, molecular neurobiology, brain disorders.

Selma Supek
METHODS FOR FUNCTIONAL BRAIN IMAGING MAKE MIND VISIBLE

The development of a range of functional brain imaging methods such as electro- and magnetoencephalography (EEG, MEG), transcranial magnetic stimulation (TMS), positron emission tomography (PET), functional magnetic resonance imaging (fMRI) and optical imaging (OI) has made a noninvasive insight into human brain functions and related development in the field of cognitive neuroscience possible. We addressed the issue of spatio-temporal resolution and a need for multi-modal integration of different functional imaging techniques due to the correlated nature of the measured signals and the fact that none of the techniques solely provide sufficiently detailed insight into the brain activity of interest. The unique advantages of neurodynamic methods and their ability to track the evolving neuronal activity in real time are emphasized. A series of our neuromagnetic studies on the

functional organization of the human visual cortex is presented including identification of multiple retinotopically organized regions within early visual activity, evidence for visually evoked *Mismatch Negativity* when the emotional faces were presented in an *oddball* paradigm and evidence for a face inversion effect in the primary visual cortex. The presented results would not have been possible without an interdisciplinary team approach, which is crucial in addressing the complex mind-brain-society problem.

Key words: functional brain imaging, neurodynamic methods, spatio-temporal localization, visual cortex, retinotopic organization, electroencephalography, magnetoencephalography, transcranial magnetic stimulation, positron emission tomography, functional magnetic resonance imaging, optical imaging.

Melita Kovačević

NEUROLINGUISTICS AS A CONNECTION BETWEEN THE BRAIN AND THE MIND: THEORY, RESEARCH AND APPLIANCE

Cognitive neuroscience is a prominent research field which encompasses knowledge of different areas. Neurolinguistics is certainly one among them which plays an important role. It is focused on neurological brain functions and processes relevant for language functioning. Clinical experience as well as a high level of research design is required for further developments in the area of neurolinguistics. Simultaneously, with theoretical concepts, which intend to explain the relationship between language and the brain, theoretical linguists test their claims by exploring a clinical population.

A short historical overview, a range of clinical and experimental methods as well as some basic theoretical assumptions and interests of clinical neurolinguistics have been presented. Within the framework of the given facts and thoughts, directions for intensified development of the area of neurolinguistics in our scientific reality have also been provided.

Key words: neurolinguistics, cognitive neuroscience, language processing, clinical methods, experimental methods.

The cognitive revolution brought about a new direction into the debate about the nature of language acquisition in humans. The Generative theory has made very strong claims about the innateness of language: not only is the vaguely defined ability to speak innate, but the concrete grammatical principles are also. This explains how children acquire language quickly, even though they are exposed to a degenerate and incomplete input. Two main arguments are briefly presented and discussed: the argument drawn from learnability and the argument drawn from the localization of language function in the brain.

However, when new insights are taken into account about the way genes define “innate properties”, claims on the innate representations come up against many problems and arguments, in favour of new theoretical approaches that take into account recent discoveries in genetics and developmental neuroscience.

Key words: language acquisition, innateness hypothesis.

PRIMARY EMOTIONS AS MODULAR MECHANISMS OF HUMAN MIND

Evolutionary psychology conceptualized the human mind as a set of specialized mechanisms or modules, which are evolved for dealing with specific adaptive problems. The main reasons why evolutionary psychology prefers modular over a general-purpose view of the human mind as well as the basic features of modular mechanisms are presented in this article. Arguments which showed that primary emotions, like other adaptations, have modular structure are also discussed. They are illustrated by research, which demonstrated that some processes related to primary emotions proved to be innately specified, based on specified neural architecture, domain specific, fast and automatic, informationally encapsulated and relatively inaccessible to central systems, which are characteristics usually attributed to modular mechanisms.

Key words: emotions, human mind, modularity.

Pavle Valerjev

HISTORY AND PERSPECTIVE OF ARTIFICIAL INTELLIGENCE DEVELOPMENT IN BRAIN RESEARCH

The purpose of this paper is to give a brief introduction to a branch of computer and cognitive sciences that is called artificial intelligence (AI). First, problems with AI definitions are shown and the difficulties with goals and research subfield diversity are presented. Also, there is a brief report on the history of artificial intelligence, its state-of-art, as well as predictions about artificial intelligence in the close future. This paper as a whole underlines an approach in artificial intelligence that is also a constituent part of cognitive science. Such an approach is called cognitive modelling and its task is to develop systems that simulate some aspect of cognition in the same way as it would function in a natural (mostly human) cognitive system. Two main approaches in cognitive modelling, symbolism and connectionism are described and adequate examples of such architectures are illustrated. Finally, artificial intelligence and the possibility of constructing "thinking machines" are argued from philosophical standpoints. In addition, social problems as well as problems connected to law and ethics that would probably appear in a future society that would be able to create "real" artificial and intelligent beings are given.

Key words: artificial intelligence, cognitive science, cognitive modeling, symbolism, connectionism.

Davor Pečnjak

HUMAN MIND, HUMAN BRAIN AND PRACTICALITY

In this article, I reviewed type-type physicalism, token-token physicalism, supervenience and interactionistic dualism. Type-type physicalism claims that types of mental states and events are identical to physico-chemical types of states and events in the brain. Token-token physicalism claims that mental states and events are identical to some physico-chemical events in the brain: thus, the same type of mental state or event does not need to be realized by the same physico-chemical states or events. Supervenience gives a logical frame as to how entities or properties of a higher order depend on basic entities or properties and is applied to the mind-body problem. Interactionistic dualism claims that if we want to explain the human mind,

we also have to invoke immaterial substance in which it is realized, but – in the connection with brain events: they cause immaterial events in the mind and in reverse immaterial events can cause physico-chemical events in the brain. Advantages and problems of these theories are presented and in the end I give a very brief commentary about the philosophy and practical aspects of brain knowledge.

Key words: type-physicalism, token-physicalism, supervenience, dualism, interactionism, mind, mental states, brain.

Veljko Jovanović
Vladimir Ivković
Tomislav Janović
Damir Nazor

BRAIN, COMPLEX SYSTEMS AND HUMAN COMMUNITIES -
CONTEMPORARY ANTHROPOLOGICAL PERSPECTIVE

The article deals with the possibility of applying cybernetic models in anthropology and its relevancy for the brain science. Special attention is given to the phenomenon of complexity.

Key words: cybernetic models, complexity, human brain, anthropology, demography.

II. CONTEMPORARY KNOWLEDGE ABOUT CLINICAL AND EDUCATIONAL ASPECTS OF HUMAN BRAIN AND MIND “FUNCTIONING”

Josip Hrgović

THE MENTAL HEALTH IN HEALTHY SOCIETY: THE SOCIOLOGY OF MENTAL HEALTH MAIN PROPOSITIONS

The Sociology of Mental Health (SMH) represents an intellectual viewpoint opposed to the dominant biomedical model with regard to important key issues. Dissimilarities between these two models are encapsulated in the general prepositions regarding the brain, mind, individual, and society interactions as well as in the specific issues concerning the preservation of mental health. The main proposition of SMH is that individual experience of psychopathology is inextricably embedded within its social context. Mental disorders are not uniformly distributed throughout society, but are concentrated more densely within some social strata. The occurrence of abnormality is a normal by-product of the routine functioning of society that serves the interests of some of its segments while harming others. The main social antecedents of mental illnesses are socioeconomic disadvantage and the unequal distribution of material and psychosocial resources that might otherwise ameliorate the harmful impact of exposure to social stressors. In societies where the SMH perspective is relatively influential its practical effects on the centers of political power, primarily centers of the public health can be observed. The final targets of SMH opponents are politically active persons, whose resolutions carry responsibility to contribute to a more justifiable, and in line with SMH findings, a mentally healthier society.

Key words: sociology of mental health, social model, individual model.

Meri Tadinac

BIOPSYCHOSOCIAL DETERMINANTS OF ILLNESS AND HEALTH

According to the biopsychosocial model, biological, psychological and social factors play equally important roles in illness and health. Chronic stress can suppress the activity of the immune system. In addition, there are considerable individual differences in the perception of events

as stressful and reactions to them, depending on personality, coping styles, self-respect, locus of control, optimism vs. pessimism, perceived self-efficacy and perceived social support. Moreover, not only can stress exacerbate the illness, but there are also reciprocal effects: the exacerbation of illness can result in psychological imbalance. The effect of illness will depend not only on individual traits, but also on the features of illness itself, whereas its severity might not be the crucial factor. It is necessary to examine the biological, psychological and social determinants of health and illness; to establish the effects of illness on patients, and the factors which determine their perception of disease and reaction to it; to determine the psychological variables which moderate the function of the immune system. The theoretical contribution of this kind of studies lies in possible explanation of interactions between biological, psychological and social determinants of illness. The practical contribution of these studies is consisted of (1) the development and application of effective preventive, diagnostic and therapeutic strategies, (2) the design of educational programs for medical staff, with the purpose of improving medical care and (3) the additional training of psychologists in the prevention as well as in psychosocial intervention programs for the chronically ill.

Key words: biopsychosocial model, health and illness, stress.

Slavko Sakoman
BRAIN, ADDICTION AND SOCIETY

Psychoactive substance abuse, especially of those substances that can cause addiction, is an important social phenomena and one of the most difficult public health problems in the contemporary world. Increased consumption of psychoactive drugs and the emergence of legal and illegal drug addicts are the consequences of changes in the quality of life, associated with the availability and demand of these substances. More and more people are feeling frustrated, anxious and depressed or they are under a lot of stress, so they need "something". More and more people as a result of their hedonistic orientation and life philosophy "I live here, now and only once", despite the risks, accept drug abuse because it is easily accessible, simple and a very effective way to experience pleasure and satisfaction. In this paper, mechanisms by which different kinds of psychoactive substances work and simultaneously

damage neurobiochemical structures of the brain, causing a number of harmful consequences are described. The mechanisms of development and maintenance of addiction as chronic, relapsing and progressive diseases of the brain are described. Without quality social interventions in which the availability and demand of psychoactive substances should be decreased, the health and normal functioning of the most important human organ – brain - cannot be protected. Addiction as a disease is very difficult to treat. There are many secondary consequences of psychoactive substance abuse for society. In this paper, the strategy and measures, which must be constantly performed to keep these sociopathological phenomena under control and within limits that are tolerable for society, are described.

Key words: drug addiction, brain, psychoactive substance abuse, social values, treatment, prevention, Croatia.

Ljiljana Pačić-Turk

PERSPECTIVES OF CLINICAL NEUROPSYCHOLOGY

In recent years, both in Croatia and throughout the world, there has been an increase in the number of patients suffering from brain damage, especially craniocerebral traumas and cerebrovascular diseases. Although the neurological recovery of these patients is often satisfying, significant deficits in mental functions frequently remain. When diagnosing these deficits, it is necessary to include neuropsychological assessment, since only this kind of assessment gives detailed information on the quality and extent of deficits in general intellectual functioning, thinking, memory, perception, language and speech, as well as other specific functions. In Croatia today, there is a profound need for the establishment of a center for neuropsychological rehabilitation with experts of different profiles. This is one of the directions in the development of clinical psychology in our country in the future. In this paper, the importance of such a center in improving the recovery of mental functions is emphasized and a general agenda of such a center is outlined.

Key words: brain damage, neuropsychological diagnostics, neuropsychological rehabilitation.

EMOTIONAL TRAUMA AT CHILDREN, SOCIETY AND NEUROSCIENCE

This article discusses the role of early negative stimulation and trauma on the formation of attachment, consequent neurophysiological and neuroanatomical changes and the behavioral and emotional consequences of inadequate early stimulation. The possible guidelines for preventive programmes are discussed with regard to developmental psychology and neuroscience. Furthermore, the possibility of implementation is critically viewed given the current social resources.

Key words: attachment, early trauma, developmental neuropsychological, prevention.

EDUCATION WITH THE BRAIN IN MIND

Three phases in the development of thinking about the brain and a connection to education can be distinguished. In the first, the brain/student is regarded as a “tabula rasa”. The educational need is for a clear and standard input of facts. In the second, it is recognized that the brain/student has, when they enter a classroom, substantial pre-existing internal organization. In the third, it is recognized that the brain/student has autonomous exploratory capabilities. Outputs, along with expectations of resulting input are internally generated; learning occurs as a result of comparisons between the expected and the actually experienced inputs. As educators, we should be interested in how brain research might improve educational practice. However, we should be very cautious. Neuroscience has discovered a great deal about neurons and synapses, but not nearly enough to guide educational practice. In that sense, cognitive psychology is a much better bet. It already is helping us solve many educational problems. This article deals with some of its findings and suggestions about its practical educational implications.

Key words: brain, learning, teaching, cognitive psychology.

Jasna Cvetković-Lay

RELATIONSHIP TO THE CHILDREN WITH HIGH ABILITIES IN
EU COUNTRIES - REALITY OF CROATIAN TENDENCIES

This review deals with a comparison between developed EU countries versus transitional countries regarding the social treatment of individuals with high abilities. Indicators of some scientific research about individuals with high abilities are also compared with their practical application in organizing the supporting network for the gifted in society and the educational system (gifted education). The main issue is what or who is the “decision maker”, or that which mostly influences personal talent development or the development of society in general. At the end, a short review of the most significant points of supporting network for the development of highly able persons in the EU is added.

Key words: high abilities, gifted education, personal talent development, countries in transition, EU.