

CEREBRAL SYMMETRIES AND ASYMMETRIES: NEUROPSYCHOLOGICAL APPROACH

Tatiana V. Chernigovskaya

I. Sechenov Institute of Evolutionary Physiology and Biochemistry,
Russian Academy of Sciences, 194223 St. Petersburg, Russia

The time has come to discuss the role of symmetry paradigm for brain sciences and even for anthropogenesis. It is evident that dual character of cerebral organisation, specific functions of the right and the left hemispheres for sensory, cognitive and linguistic functions makes us think of more global value this paradigm plays in life sciences. There are data expressing both symmetric and asymmetric features and even structures. It looks like neuronal activity governing language is spread over both cerebral hemispheres, beyond the areas traditionally associated with it. Current functional brain imaging demonstrates flood of activation from area to area, starting from frontal attention areas and coming to right-hemispheric areas homologous to Wernicke. Not only functional but anatomical asymmetries are found, i.e. right-handers typically have much larger left planum temporale in comparison with the right-sided homologous area; left occipital pole is wider and protrudes more posteriorly than the right, there are anatomical variations in corpus callosum in relation to hemispheric specialisation, pars triangularis (a portion of Broca's area) was shown to be relevant for language dominance in males and females, etc. There is cytoarchitectonical argument for anatomical cerebral asymmetry not only in homo sapiens but already in homo erectus and homo habilis. Cerebral asymmetry characterising specifically human neuronal mechanisms of cognition and language was and is the basis of a tremendous evolutionary break-through.

The paper presents experimental data revealing linguistic and cognitive features specific of cerebral hemispheres in neurological psychiatric patients as well as in normal individuals subjected to a battery of lateral perceptual, cognitive and motor testing. The data show cardinal differences in hemispheric mentality both in verbal and non-verbal procedures, like metalinguistic abilities, perception of speech sounds, rhythms, understanding metaphors and idioms, syllogistic reasoning, animistic thinking, retention abilities, etc. Cultural, gender and ontogenetic differences are shown. Parallel, symmetric and 'doubling' features are discussed.