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by

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GEOMETRIC STRUCTURES IN BIOLOGY AND MEDICINE. CONFIGURATIONS AND TOPOLOGY CHANGE IN PHYSIOLOGICAL AND PATHOLOGICAL PROCESSES

MÁRIA MINÁROVÁ

Abstract. Life is change. Each living organism undergoes permanent change during its lifespan. Since a living organism is open system, it interchanges mass and energy with the ambient, it has external interactions. Many physiological processes of various kinds (mechanical, chemical, electrochemical) run permanently in the organism changing its inner structure, architecture and geometry. Components are permanently rebuilt, some of them fade out, others originate. Everything is in an unceasing movement, all in a wonderful and perfect harmony. Indeed, geometry and topology of the organs, tissues, cells and organelles develop during the turbulent physiological process of life. Moreover, pathological changes caused by injuries or diseases run in the human body as well. They are often devastating.

This paper deals with the geometry of the human body and its parts, tackling topological and non-topological changes within. Two previous papers of the author, describing a biomechanical and a biomedical investigation are regarded from topological point of view; two main parts of the paper are devoted to the homogenization of material properties of intervertebral disc of human spine, and the fractal analysis modelling the cancer tissue growth.

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Key words and phrases. biological structure, anisotropy, annulus fibrosus, material homogenization, mastopatic and cancer tissue, random fractals.

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