# SEMINARIUM RENTGENOWSKIE

Dnia 15.07.2014r. o godz. 10.00, w sali D Instytutu Fizyki PAN, odbędzie się seminarium rtg., na którym **dr Jarosław Majewski** z Los Alamos National Laboratory, University of Chicago, wygłosi referat na temat:

## "Neutron Scattering Studies of Endothelial Interfaces – Master Gatekeepers of the Cardiovascular System"


Abstract:

We report on the first-ever successfully completed neutron reflectometry experiments on living human endothelial cells under fluid mechanical shear stress that provide valuable insight on the boundary layer dynamics of complex bio-medical systems, which could lead to advances in the treatment of atherosclerosis and other disorders associated with the cardiovascular system.

Key in controlling the two functions of the vascular system - selective vascular resistance and anti-thrombotic properties - is a monolayer of cells termed endothelium that covers the inner surface of blood vessels. Given that the vascular system is under constant fluid mechanical stress due to its nature as a fluid conduction system, it is not surprising that mechanical forces influence endothelial cell function and response.

It has been shown that endothelial cell monolayers grown on solid substrates and exposed to shear rates activate a cascade of biochemical pathways that restructure the internal cytoskeleton of the cell and cell-substrate anchoring points called focal adhesions. Shear induces the cells to undergo a symmetry-breaking transition whereby the entire cell monolayer aligns along the direction of shear.

Another highly studied area involving endothelial cells and fluid mechanical shear stress involves pathologic buildup of lipids in arterial walls: atherosclerosis. Previous worked could show that the distribution of atherosclerotic lesions in the vascular network corresponded to areas of turbulent blood flow occurring at bifurcation points in the arterial tree.

Most existing work in endothelial mechano-biology has focused on single cells and even single molecules and protein complexes. Yet the collective behavior of the monolayer of cells has been less well explored. It is clear however that endothelial cells makes strong lateral connections between each other and that these connections change as a function of mechanical stress.

Neutron reflectometry is able to reveal information that is inaccessible to other techniques, *e.g.* the structure and composition of the boundary layer between the endothelial cells and the supporting substrate. The thickness of such a layer, its composition (protein rich *vs.* fluid rich), and most importantly how its composition and structure changes as a function of shear, is of high significance for the understanding of the fluid mechanical shear stress on endothelial cells and the effects this has on overall blood vessel health.


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