

## Grigory Panasenko

### *Flows in thin tube structures*

The tube structures are the domains of a small measure which are connected finite unions of thin cylinders (or rectangles in the 2D case). The small parameter here is the ratio of the diameter to the height of the cylinders. We consider the Stokes, the Navier-Stokes equations as well as the micropolar flows in such domains. The boundary conditions are either that of the Dirichlet type (absolutely rigid walls) or the elasticity of the wall is taken into account. In the last case the rigidity of the wall is the second parameter. For these problems an asymptotic expansion of the solution is constructed. This asymptotic analysis is applied then for the implementation of the method of asymptotic partial decomposition of domain (see G.Panasenko, *Multi-Scale Modelling for Structures and Composites*, Springer, 2005). This method reduces the dimension to one in the main part of the tube structure, keeps the initial dimension in some small neighbourhoods of the ends of thin cylinders and prescribes the appropriate interface conditions between the reduced 1D parts of the cylinders and the 3D (or 2D) parts containing the junctions of the cylinders (rectangles) and their ends. The main application of this analysis is the first step in the modelling of the blood circulation (PICS CNRS French-Russian project and the International French-Romanian cooperation CNRS project 17033). Partially the results are obtained in collaboration with Ruxandra Stavre and Delphine Dupuy.