Exhibitor # 43/44 **Poland**

Institute of Fundamental Technological Research, Polish Academy of Sciences

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Bio & Technology Innovations Platform

Short Description:

About the organization, history:
Institute of Fundamental Technological Research of the Polish Academy of Sciences (IPPT PAN), with its staff of about 150 highly qualified researchers (of whom 56 are full or associate professors), is one of the largest Polish research centres in the multi-disciplinary area of mechanics of solids, structures, fluids and biomaterials, engineering acoustics including non-destructive testing methods and ultrasonic applications in medicine, information technology, mechatronics, robotics and ecologically oriented construction engineering. Created in 1953, the Institute was soon recognized as a leading research centre not only in East and Central Europe, but also in the world scale.

Experience, special know-how: A few exemplary achievements in the form of patented solutions can be mentioned: Method of ultrasound diagnostics of osteoporosis and the device; Method and device for evaluation of the acoustic parameter of nonlinearity B/A of biological fluids and tissue; Biodegrading multilayer packaging material and its method of production.

Technologies under development: Exemplary projects: Application of electospinned yarn as an active bandage for prevention of traumatic brain tissue; Implementation of digital processing and new diagnostic algorithms in cross-skull Doppler screening; Interactive programming environment for optimal control solutions.

Type of cooperation sought: "New method of stress evaluation during epitheliome growth". The result of the research will be the developed integrated modelling environment for the detailed simulation and study of realistically sized tissue samples. The basis of the environment will be the FLAME (Flexible Large-scale Agent-based Modelling Environment) that has been developed as the first agent-based supercomputing facility for modelling complex systems. The project will be based on detailed models of millions of individual cells with their key structural behaviour linked by the DEM and FEM solvers in which tissue's biological and physical properties are described. Applying the FEM and DEM methods joined with FLAME the stresses in the evolving tissue will be determined. Modelling the cytoskeleton and the intercellular connections will provide a challenging subject to integrate both the agent-based models of individual cells with the physical model of the overall tissue on a supercomputer and could provide a key resource to understand many open medical problems such as wound healing, precancerous development and so on. The computing challenges in integrating these modelling paradigm for supercomputers are significant as well.