Micro-swimming in complex environments

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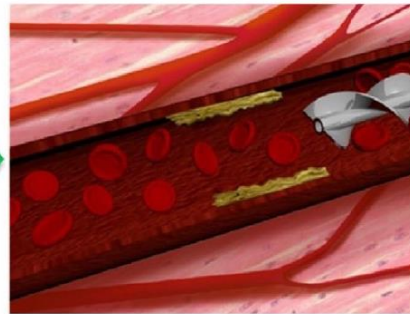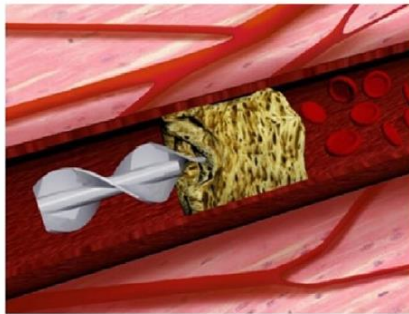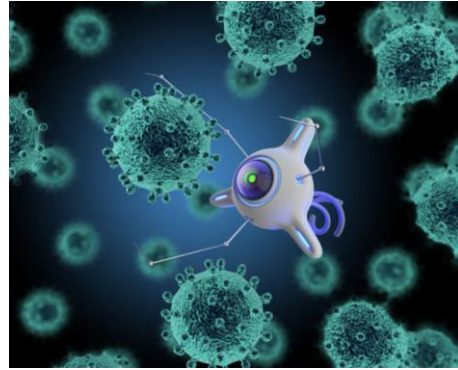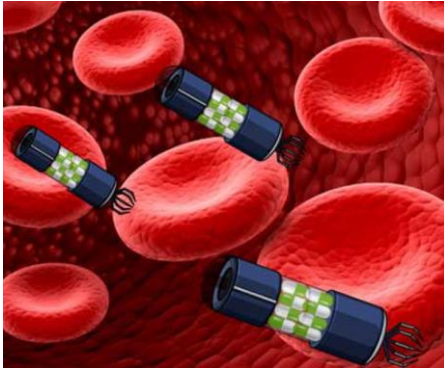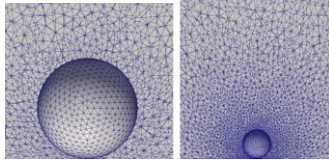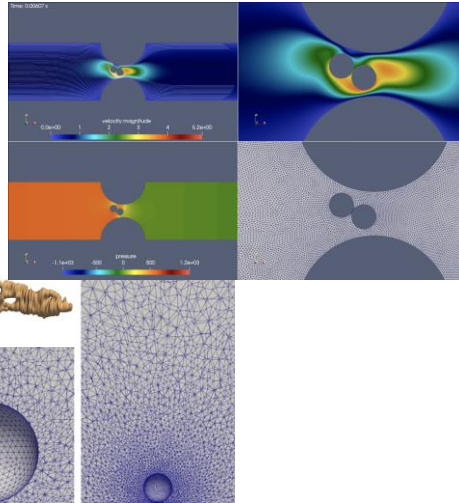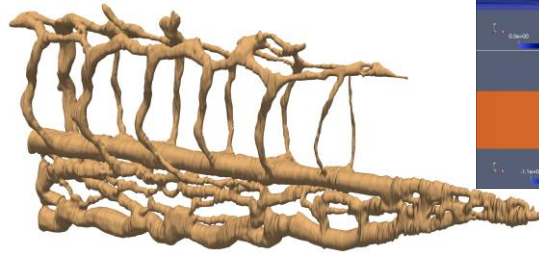**Collaboration with: Inria, Université Côte d'Azur**

Micro-swimmers for medical applications

Challenges

❖ **Complexity of fluid-structure interactions:** coupling of hydrodynamics and dynamics of freely moving soft bodies

❖ **Collective motion**

❖ **Complex environments**

❖ **Collision detection and inter-particle interactions**

HPC aspects

Numerical resolution, WP1 + WP3

- Discretization of complex 3D domains
- Mesh construction, adaptation, and re-meshing
- Collision detection using raytracing (BVH using MPI + GPU) or the fast-marching method
- Resolution of the multi-physical algebraic system
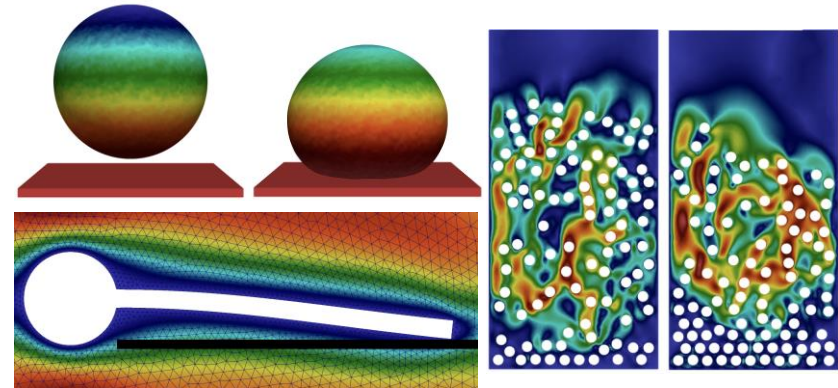- Contributed a benchmark to deliverable D7.1

Optimization and Control, WP5

- Control of the collective motion of active bodies
- Control of the trajectory of driven magnetic swimmers
- Methods: Bayesian optimization, (Deep) reinforcement learning (WP2)

Thank you for your attention !

NumPEx