LadHyX Seminar – October 8, 14:00

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Geoinspired bioreactors

Inspired by the precession of the Earth, a new bladeless mixer has been designed, which consists of a tilted and rotating cylinder. I will first present fundamental studies on flows inside precessing cylinders. At specific aspect ratios, the resonance of eigen modes creates a strong overturning flow even for small tilt angles. At large enough Reynolds number, this base flow transitions to a turbulent flow thanks to a parametric instability involving a triadic resonance.

I will then describe how these results have been used to simplify the precessing set-up in order to build large scale mixers. The mixing has been found to be as efficient as using a classical Rushton turbine, but with a shear 20 times smaller. This soft mixer is thus particularly interesting for bioreactors which require an efficient mixing of oxygen and carbon dioxide but where a strong shear can damage fragile cells. Preliminary results obtained for the growth of microalgae in such photobioreactors suggest that it can be a technological breakthrough in biotechnologies.