

Mô phỏng về chất lưu sinh học: Mô hình đối lưu sinh học bởi chuyển động hấp dẫn của các vi sinh vật (External Bio-fluid modeling: Bioconvection pattern by gravitactic motion of micro-organisms)

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Micro-organisms exist in all natural ecosystems and form a major part of planetary bio-mass. Generally, swimming aqueous micro-organisms are more or less passively mobile in large scale flows generated by various forces. However, in quiet fluids, the slow, bulk micro-organism motion can affect the system hydrodynamics through a process called bioconvection, which can create remarkable spatial patterns within the fluid.

Bioconvection is a natural phenomenon observed from suspensions formed by various swimming micro-organisms such as protozoa, algae, or bacteria. Bioconvection is a major topic in the study of biological fluid dynamics which is divided into internal dynamic fluids (or physiological fluids) and external dynamic fluids (swimming or flying). The latter is more precisely defined as the interaction of living organisms within their ambient fluids. This natural paradigm, which is composed of biological, physical and mechanical processes, has been elucidated by mathematical models only within the last three decades.

We present a study on gravitactic bioconvection (gravitaxis or negative geotaxis) in using numerical analysis and the concept of external bio-fluid modeling.

EDUCATION

October 2006- present : Post-doctoral fellow – Researcher at URPEI (Unité de Recherche des Écoulements industriels), University of Montréal.

Sept 2002 - Sept 2006 : Ph.D. in Mechanical Engineering – Department of Mechanical Engineering, École Polytechnique de Montréal, University of Montreal, Canada. Dual-Doctorate Diploma in Fluid Mechanics from the Mechanical Institute of Marseille – University of Mediterranean, France

1996 –1997: Master Degree (Diplôme d'Etudes Approfondies - DEA) in Applied Mechanics, University of Joseph Fourier and Institut National Polytechnique de Grenoble (INPG - France).

1989 –1994: Bachelor Degree in Civil Engineering (Engineering Diploma) at the Polytechnic University of HoChiMinh City – Vietnam.

PROFESSIONAL EXPERIENCE

March 2006 – present: Researcher in cooperation with Microbiology and Immunology Department, Faculty of Medicine, University of Montreal, Canada.

2005: Researcher at the Department of Cellular Biology, Faculty of Medicine and Pharmacy, University of Auvergne, Clermont-Ferrand I – France; Mycology and Microbiology Laboratory – Faculty of Biotechnical Engineering, University of Minho, Braga – Portugal; Department of Environmental Microbiology and Ecology, Faculty of Paul Cézanne, University of Aix-Marseille II, France; UNIMECA Laboratory, Institute of Mechanics of Marseille, University of the Mediterranean, France.

Selected Publications:

- Nguyen Quang Tri, Nguyen The Hung (2006). Gravitactic bioconvection in a fluid-saturated porous medium with double diffusivity. Submitted to Journal of Porous Media.
- Nguyen Quang Tri, Nguyen The Hung, Ana Nicolau, Daniel Morency, Georges Smatzari, Nelson Lima (2006). Onset of the Gravitactic Bioconvection of *Tetrahymena pyriformis* in the Hele-Shaw apparatus. Submitted to the Journal of Applied Microbiology.
- Nguyen Quang Tri (2007). Onset of gravitactic bioconvection in a square anisotropic porous medium with principal axes non-coincident with the gravity vector. Manuscript accepted for publication in the International Journal of Heat and Mass Transfer.
- Nguyen Quang Tri, Nguyen The Hung (2007). Study of the Onset of Gravitactic Bioconvection in a Fluid-Saturated Porous Medium: Theory and Experiments. In process to submit to the International Journal in Heat and Mass Transfer.
- Nguyen Quang Tri, Philippe Tanguy (2007). An analysis of the Maxblend impeller hydrodynamics with Newtonian fluids by Particle Images of Velocimetry (PIV) method. In process to submit to the International Journal of Chemical Engineering.