



Supervisor's assessment for Václav Štumbauer – Vyjádření školitele k plnění úkolů studijního plánu a k disertační práci Ing. V. Štumbauera

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Václav Štumbauer started his doctoral study in 2008, he has chosen as the topic of his Ph.D. thesis one of the ongoing projects of the Laboratory of experimental complex systems (formerly *Biotechnology group of the Institute of Physical Biology in Nové Hradky*). He accomplished all his duties related to the study programme by making the state examination on December 16th, 2011. His thesis is entitled *Modeling, parameter estimation, optimization and control of transport and reaction processes in bioreactors* and has the form of the compendium of commented scientific papers published during his postgraduate study. The main aim was to bring the up-to-day mathematical and computational tools to the field of biotechnology with microalgae. Although the chosen model of photosynthetic reactions, the so-called model of photosynthetic factory, is rather simplistic, the whole approach is independent on the specific model and it presents a reasonable choice.

In order to correctly describe the transport and reaction processes in a bioreactor, Václav has successfully implemented an innovative method (LBM - Lattice Boltzmann Method), particularly suitable for further parallelization. He was able to prove the viability of this method, for a case study of Couette-Taylor bioreactor. However, many theoretical and practical problems remain to be solved. E.g., it was planned to study the role of the hardware platform; unfortunately, Václav made only the first step in this direction, clarifying the potential of new supercomputers.²

Václav is familiar with the experimental work as well, although it is not materialized in his thesis. In the Summer school 'Schola ludus', in Nové Hradky 2011, he led the project entitled 'Cultivation of microalgae in Couette-Taylor bioreactor: Effect of hydrodynamic shear stress on microalgae photosynthetic activity'.

Václav presented his scientific results in various meetings and conferences, e.g., University of Trento, Italia (HiBi09), University of Leeds, UK (ICTW 2011), Universidad Politecnica de Valencia, Spain (MMEHB 2011), Rožnov pod Radhoštěm (HPCSE 2015), and he published them in impacted scientific journals *Mathematical and Computer Modelling*, in 2011 (IF=2.22) and 2013

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²See e.g., Anselm or Salomon, IT4Innovations, VŠB-TU Ostrava.



(IF=2.84), and *Mathematics and Computers in Simulation* in 2012 (IF=1.22), cf. his thesis.

As his supervisor, I state that Václav has shown to be an independent, competent individual, working on his own, even though with certain problems to fulfill the deadlines (which can be understood knowing his duties as the father of two children).

In conclusion, Václav has met all requirements for the proper completion of doctoral studies and therefore I recommend his work to be defended.

Sincerely,

Štěpán Papáček