KOLLOQUIUM ÜBER NEUERE ARBEITEN AUF DEM GEBIETE DER MECHANIK UND STRÖMUNGSLEHRE

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EINLADUNG

zum Vortrag von Herrn

Prof. Andrey V. KUZNETSOV

North Carolina State University

über

Approximate modeling of the leftward flow and morphogen transport in the embryonic node

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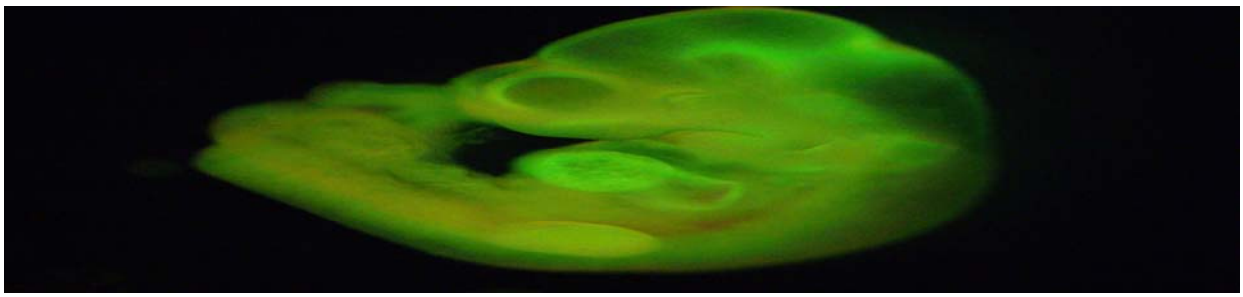
Ort: SEM 303
Institut für Mechanik und Mechatronik
Wiedner Hauptstraße 8-10, 4. Stock, 1040 Wien



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Approximate modeling of the leftward flow and morphogen transport in the embryonic node

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We developed an approximate method for modelling the flow of embryonic fluid in a ventral node. We simplified the problem as flow in a 2D cavity; the effect of rotating cilia was modeled by specifying a constant vorticity at the edge of the ciliated layer. We also developed an approximate solution for morphogen transport in the nodal pit. The solutions were obtained utilizing the proper generalized decomposition (PGD) method. We compared our approximate solutions with the results of numerical simulation of flow caused by the rotation of 81 cilia, and obtained reasonable agreement in most of the flow domain. We discuss locations where agreement is less accurate. The obtained semi-analytical solutions simplify the analysis of flow and morphogen distribution in a nodal pit.

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Dr. Kuznetsov joined the Department of Mechanical and Aerospace Engineering at NC State University in 1998 after his postdoctoral appointments at Ruhr-University of Bohum (Germany), Ohio State University, and Vienna University of Technology. He received PhD in Mechanical Engineering from Russian Academy of Sciences in 1992. Dr. Kuznetsov's research interests are in general thermofluids area, including transport in porous media, transport in living tissues, bioheat transport, bioconvective sedimentation, Newtonian and non-Newtonian flows, flows in microgravity, and turbulence. His most recent research addresses modeling of electroporation, thermal dose optimization in cancer treatment using hyperthermia, and intracellular transport. He attracted funding from many agencies, including DARPA, NSF, NASA, EPA, NATO, USDA, DTRA, and NTC. He is also actively engaged in training graduate students, particularly at the Ph.D. level, and has supervised 25 graduate students over the past 15 years. He published more than 350 journal papers, 2 books, 10 book chapters, and more than 80 conference papers. He is also an affiliate faculty member of the UNC/NCSU Biomedical Engineering Department, Fellow of ASME, an Associate Editor of the ASME Journal of Heat Transfer, and a winner of a Humboldt Research Award.