WWTF Project VRG17-014

Kinetic Theory Applied to the Study of Fertility, Cancer and Development

Zusammenfassung

Natural events take place across multiple scales, spanning from the sub-atomic scale to the entire universe passing through many intermediate scales that include, for example, molecules, cells, tissues, organs, full individuals, ecosystems, planets and galaxies. In constrast, scientific knowledge is usually constrained to a particular scale. Thus our knowledge becomes `layered', that is, it is confined to what it can be observed at that scale. With this layered knowledge, we miss the big picture: how phenomena at each scale are connected to the other ones. Particularly, how is what we observe at larger scales a manifestation of the underlying phenomena at smaller scales? For example, how do tissues arise from cells? How do organs arise from tissues? How is the population behaviour the result of the individuals' behaviour? Connecting the different layers of knowledge is a challenging endeavour, but it is of capital importance to gain full understanding. Mathematics comes to our help, particularly, 'kinetic theory'. The idea, in a nutshell, is that we are able to derive equations for large-scale dynamics from the equations at a smaller scale. This derivation is precisely the link between scales that we seek for. In this project, we apply kinetic theory to the study of fertility, cancer and development.

Wissenschaftliche Disziplinen:
101004 - Biomathematics (60%) | 302089 - Reproductive medicine (20%) | 301904 - Cancer research (20%)

Keywords:
hydrodynamic limits; kinetic theory; collective motion; cancer; cell migration; sperm; metastasis; epithelial tissue

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Weiterführende Links zu den beteiligten Personen und zum Projekt finden Sie unter
https://wwtf.at/programmes/vienna_research_groups/VRG17-014