

NUMERICAL METHODS FOR CELL MIGRATION: MODELING, SIMULATION, AND APPLICATIONS

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ABSTRACT

Cell migration is a fundamental biological process that plays a critical role in diverse phenomena such as embryonic development, the immune response, wound healing, and cancer metastasis. Understanding and predicting cell migration in complex biological environments pose significant challenges that require advanced mathematical modeling and numerical simulation methods. Recent years have seen considerable advances in the development of continuum and discrete models for cell migration, including phase-field methods, finite element methods, agent-based methods, immersed boundary methods, boundary integral methods, regularized stokeslets, and various hybrid approaches. Cell migration models often need to incorporate biophysical processes such as chemotaxis, durotaxis, extracellular matrix remodeling, and mechanical feedback between cells and their environment. Coupling such complex processes with robust and efficient numerical solvers remains an active area of research with significant challenges.

This minisymposium aims to bring together researchers from across organizations and disciplines such as applied mathematics, computational mechanics, and biomedical engineering, to explore state-of-the-art numerical methods tailored to the modeling and simulation of cell migration. It will provide a platform to discuss recent developments in modeling approaches and numerical methods used to simulate cell migration, with various applications. In addition to development of new modeling and simulation methods, the session will also encourage the integration of experimental data into simulations via validation techniques and translation of computational results into biological insight.

We have had four confirmed speakers from Germany, Belgium, Canada, and the USA and two interested speakers. We are inviting more people from all over the world.

REFERENCES

- [1] Chen, L., Painter, K., Surulescu, C. and Zhigun, A., 2020. Mathematical models for cell migration: a non-local perspective. *Philosophical Transactions of the Royal Society B*, 375(1807), p.20190379.