PhD position in Non-Equilibrium Statistical Physics

I expect to have a **Research Associate** / **PhD position** funded shortly at the Institute for Theoretical Physics at the University of Göttingen in the area of **non-equilibrium statistical physics**, specifically for a project on Non-equilibrium structure formation by phase separation in multi-component mixtures (see summary below).

The position would be embedded in, and funded by, a collaborative research centre on "Collective behaviour of soft and biological matter" (SFB937) for a fixed term of four years, with a flexible **starting date from January 2019**. Funding would be via a 75% (of full-time) research associate contract on the German public sector scale TV-L E13.

Candidates should have an excellent university degree in physics, theoretical physics or a related area, with a demonstrated interest in statistical physics and a strong motivation for research; experience with numerical work will be useful. Fluency in written and spoken English is expected. German language skills are welcome but not essential as English is the default language for scientific interactions (seminars, group meetings etc).

The Faculty of Physics is embedded into the Göttingen Campus, which provides an ideal environment for interdisciplinary collaboration, both with other University faculties (e.g. chemistry and mathematics) and with Max-Planck-Institutes, particularly the MPI for Dynamics and Self-Organization. Formal collaborative research centres such as the SFB937 support these interactions. For computational work, the Faculty has access to dedicated High Performance Computing facilities.

Candidates who would be interested in the position should email the following documents (PDF preferred)

- A cover letter summarizing your background and explaining your interest in, and suitability for, the position
- A full CV with an overview of scientific training so far including any research projects carried out, and names of two referees

to peter.sollich@uni-goettingen.de. Informal enquiries about the position can be sent to the same email address.

Candidates are encouraged to express their interest as soon as possible, and preferably by end of **October 2018**. Formal confirmation of funding for the third funding period of the SFB937 (2019 – 2022) is expected in November 2018 and expressions of interest will be routed into the formal recruitment process then. Alternative funding arrangements can be explored for excellent candidates as necessary.

The University of Göttingen is an equal opportunities employer with a particular emphasis on fostering career opportunities for women. Qualified women are therefore strongly encouraged to apply. Disabled candidates with equivalent qualifications will be given preference.

Project summary

Phase separation in multi-component mixtures is poorly understood but should – both in colloidal systems where interactions show systematic dependences on particle properties,

and in biological mixtures with largely disordered interactions – lead to formation of non-trivial non-equilibrium structures that may be of relevance to e.g. membraneless organelles in cells.
We will derive descriptions for multi-component phase separation dynamics systematically using several complementary approaches including Langevin approximations of kinetics on lattices, fluctuating hydrodynamics for Brownian dynamics and coarse-graining by targeted non-equilibrium simulations. We will study the structure formation predicted by these approaches, with a focus on how complex multi-stage kinetics – as expected on general grounds in crowded systems – emerges from the interplay of local (spinodal) instabilities and nucleation and growth. We will consider choices of interaction parameters that interpolate between the systematic dependences on e.g. particle size in colloidal systems on the one hand, and the largely random interactions expected in mixtures of e.g. biological macromolecules on the other, to allow us to understand the effects of the existence of multiple metastable phases in the latter regime.