Soft Matter

EDITORIAL

View Article Online
View Journal | View Issue

Cite this: *Soft Matter*, 2025, **21**, 6335

Celebrating the 60th birthday and achievements of Professor Ulli Steiner

Stefan Guldin, *[abc] Mathias Kolle,*[d] Silvia Vignolini *[e] and Bodo D. Wilts *[f]

DOI: 10.1039/d5sm90096d

rsc.li/soft-matter-journal

Elucidating the interplay between a material's structure and function is a fundamental aspect of advancing soft matter science; Professor Ullrich Steiner's work has been instrumental in this pursuit. His research into materials architectures at the nanoscale has significantly impacted our understanding of how structural characteristics enable functionalities in various contexts, from interfacial phenomena to electronic properties and optical features. Advances in both natural and artificial material designs benefit from these insights, enabling new applications and devices.

Ulli's broad and infectiously enthusiastic interest in a diverse range of topics within soft matter science showcases his curiosity and dedication to the field. His studies have spanned from the fundamental phenomena of diffusion, wetting, and phase separation to exploring complex interfaces and optical phenomena across the whole spectrum of fundamental and applied science. The topical variety is reflected in this themed collection, which brings together original articles from Ulli's former group members, collaborators and academic friends. Each contribution highlights a different aspect of Ulli's influence, demonstrating the far-reaching impact of his work on the scientific community in soft matter science and beyond.

With this themed collection, we want to not just celebrate Ulli's 60th birthday and his remarkable contributions to science, but also highlight the profound impact he has had on the lives and careers of many of his former students, postdocs and academic colleagues. Ulli, as he insists on being called after a first mail exchange, currently holds the Chair in Soft Matter Physics at the Adolphe Merkle Institute in Fribourg, Switzerland. His journey in science began at Konstanz University, Germany, where

[a] *Department of Life Science Engineering, Technical University of Munich, 85354 Freising, Germany. E-mail: guldin@tum.de*
[b] *TUMCREATE Ltd. 1, CREATE Way #10-02, CREATE Tower, Singapore 138602*
[c] *Department of Chemical Engineering, University College London, London, WC1E 7JE, UK*
[d] *Department of Mechanical Engineering, Massachusetts Institute of Technology, 77 Massachusetts Avenue, Cambridge, MA 02139, USA. E-mail: mkolle@mit.edu*
[e] *Max Planck Institute of Colloids and Interfaces, 14476 Potsdam, Germany. E-mail: sv@mpikg.mpg.de*
[f] *Department of Chemistry and Physics of Materials, University of Salzburg, Jakob-Haringer-Str. 2a, 5020 Salzburg, Austria. E-mail: bodo.wilts@plus.ac.at*

Stefan Guldin

Mathias Kolle

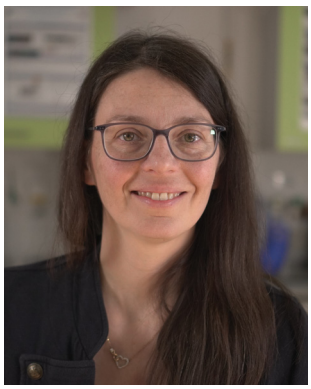
he received his Diploma in Physics with distinction in 1989. He then pursued doctoral and postdoctoral research at the Weizmann Institute of Science in Israel and the University of Strasbourg in France, before returning to Konstanz to start his career as a principal investigator, completing his habilitation in experimental physics in 1998. His academic path took him to prestigious institutions, including the University of Groningen in the Netherlands, and the University of Cambridge as the John Humphrey Plummer Professor of Materials Physics at the Cavendish Laboratory. Viewpoints from his PhD advisor, Prof. Jacob Klein (**https://doi.org/10.1039/D4SM90046D**), and his Cambridge colleague Prof. Jeremy Baumberg (**https://doi.org/10.1039/D4SM90067G**) are part of this themed collection.

Ulli's research at the frontiers of soft matter science has consistently been ahead of its time. With over 300 publications, each cited around a hundred times on average, his work has significantly influenced our understanding of material properties at the nanoscale. Beyond Ulli's impressive scientific metrics and accolades, what truly stands out is his ability to inspire and mentor young scientists. His leadership roles, contributions to various scientific advisory boards and committees, and his continuous readiness to supporting young scientists and engineers highlight his dedication to advancing science and nurturing the next generations of researchers. As founding Chairman of the Editorial Board of *Soft Matter*, Ulli played an important role in the development of this journal and in making scientific insights accessible to the broader public.

To celebrate Ulli's 60th birthday, a special meeting, focused on cutting-edge science in soft matter, was organized in Berlin in the summer of 2023. This gathering brought together about 30 of his former and current students and postdocs from the various stages and places spanned by Ulli's career. Emphasizing vivid scientific exchange, the event was also a heartfelt tribute to Ulli's influence on their lives, both professionally and personally. Attendees shared insights, laughs, and memories, giving science-focused talks that also emphasized the impact of Ulli's mentorship on their career paths. The meeting concluded on a special personal note with a pub quiz about Ulli, highlighting his admirable quirks, achievements, and the many humorous moments that he shared with everyone over the years. Informally, most of the attendees continued to celebrate until late into a warm summer night catching up with each other and reminiscing about the many shared amazing professional and personal experiences with Ulli and each other. A heartfelt "Thank you" from all participants goes out to the Royal Society of Chemistry for so generously supporting this meeting.

This themed collection of *Soft Matter* is dedicated to the scientific impact of Professor Ulli Steiner and presents a diverse collection of original articles highlighting the latest research and developments in soft matter science. Interface and adhesion phenomena are particularly important in living systems. Typically, the interface is the first accessible communication point between an organism and its environment: from cell to macroscopic system, interfaces are vital to sense, actuate, interact, protect, and proliferate. Spengler *et al.* (**https://doi.org/10.1039/D3SM01045G**) describe how adhesive patches in bacterial cells are heterogeneously distributed across the cell envelope by using experiments and simulations on structured surfaces. On a larger scale, Jentzsch *et al.* (**https://doi.org/10.1039/D3SM01511D**) study the interface of different citrus fruits from macroscopic to microscopic levels to understand their unique mechanical properties, which allow for high energy dissipation during impact. Similarly, Clark *et al.* (**https://doi.org/10.1039/D3SM01392H**) examine the biomolecular interactions at the biological interface between the soft tissue of *Quercus robur* leaves and the fungus *Erysiphe alphitoides*, shedding light on the changes induced by fungal infection and the tree's defense response.

In artificial materials, developing interfaces at the micron and nanoscale level can provide a wide range of functionalities: Oggioni *et al.* (**https://doi.org/10.1039/D3SM01489D**) demonstrate that blending polymers of interest with a small amount of a mechanochromic luminescent additive allows for the monitoring of mechanical stresses and strains in polymers *via* an optical signal. At the molecular scale, interfaces can be created by covalently linking species with



Silvia Vignolini

Bodo D. Wilts

different functionalities. For example, developing polymer–peptide hybrids incorporates the benefits of hierarchical polypeptide structures into synthetic platforms that are promising materials for hydrogel systems, as shown by Thomas *et al.* (**https://doi.org/10.1039/D3SM00780D**).

Transitioning to block copolymers, the segregation behavior of bottlebrush random copolymers at interfaces unveils a new avenue for tailoring surface properties, opening avenues for advanced coatings and adhesives, as shown by Chen *et al.* (**https://doi.org/10.1039/D3SM01484C**). Drouhin *et al.* (**https://doi.org/10.1039/D3SM01622F**), using another block-copolymer system, uncover a novel synthesis route yielding mesoporous magnetic materials with co-continuous morphologies. This unique structure profoundly impacts the magnetic behavior of the material, offering intriguing prospects for magnetic applications. Block-copolymers can also be used to produce nanoporous membranes. Hoehn *et al.* (**https://doi.org/10.1039/D3SM01498C**) showcase how triblock copolymers can be a convenient precursor to such nanoporous materials provided the end blocks are easily degradable (*e.g.*, polylactide or PLA), leaving nonporous polymeric membranes in thin film form.

Despite the multitude of applications, many fundamental aspects of block copolymer systems remain elusive. Williams *et al.* (**https://doi.org/10.1039/D3SM01754K**) explore one such aspect, demonstrating how the swelling of micelles occurs during non-equilibrium processing, where supersaturated homopolymer swelling is combined with inducing the formation of glassy-core ''persistent'' micelles.

Understanding non-equilibrium phenomena is also important in other areas of soft matter, such as colloidal particles. Parton *et al.* (**https://doi.org/10.1039/D4SM00155A**) show how additives can affect the kinetic arrest of cellulose nanocrystal suspensions and their optical response. Interfaces at the nanoscale with a material possessing different refractive indexes can lead to extraordinary optical responses. In nature, these interfaces are at the basis of the structural colour observed in a wide variety of systems; an example is the disordered photonic architecture in longhorn beetles, shown by Djeghdi *et al.* (**https://doi.org/10.1039/D4SM00068D**). Similarly, artificially disordered systems can be optimized as reported by Demirörs *et al.* (**https://doi.org/10.1039/D3SM01468A**) to achieve specific optical appearance. The mismatch of the imaginary part of the refractive index also plays a significant role in photonics. Sai *et al.* (**https://doi.org/10.1039/D3SM00961K**) elegantly demonstrate that pigment can efficiently create bright structural colors at wavelengths outside its absorption band.

By unravelling the underlying principles governing the intricate interplay between structure and function, the work of Ulli and others over the years has not only deepened our understanding of soft matter but also paved the way for the design of next-generation materials with tailored properties and functionalities. This themed collection reflects Ulli's enduring influence and a heartfelt celebration of his contributions to science and our lives.