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Topical Issue – Festschrift in honor of Philip (Fyl) Pincus

Guest Editors:

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Editorial

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1 Editorial

The EPJE Topical Issue “*Festschrift in honor of Philip (Fyl) Pincus*” is dedicated to a renowned theoretical physicist working on soft condensed matter, polymer physics, and biological physics. In the earlier part of his highly distinguished career, Pincus worked in areas related to traditional solid-state physics: magnetism, superconductivity, one-dimensional conductors, and spin-Peierls transitions. Over the last five decades, however, his body of work and communicative skills have had an oversized catalyzing effect on the polymer and soft matter communities. Pincus has been a mentor to many in the soft matter community, in particular, to generations of students, junior scientists and engineers.

His seminal work on the elongational energy of self-avoiding chains forms the basis for the study of polymers in confined geometries [1]. Pincus introduced the idea that polymers under force break up into independent blobs with a size determined by the strength of the force. These blobs are referred to as “*Pincus blobs*” in de Gennes’ book on polymer physics. Furthermore, Pincus’ scaling approach to elucidating the physical properties of polyelectrolytes is world-renowned, even though the statistical mechanics of polyelectrolytes remains incomplete [2–4].

Pincus was among the first scientists to recognize the importance of interfacial problems in soft condensed matter from a fundamental viewpoint as well as from the practical technological side. He is among the pioneers in having developed concepts essential to understanding the practical problem of colloid stabilization by adsorbing or grafting polymers [5]. These contributions have received both theoretical and experimental attention. For example, he inspired and provided the scientific leadership for the first synchrotron study that was carried out to measure the concentration profile for polymers near interfaces [6].

In addition to his major contributions to polymer physics, for which he was awarded the American Physical Society’s *Polymer Physics Prize* in 1992, Pincus has further been a leading scientist in elucidating, jointly with his collaborators, the unique role of electrostatic interactions in bio-membranes. He is among a handful of scientists worldwide who played a central role in understanding how charge fluctuation effects can lead to attractive interactions between similarly charged membranes [7, 8].

More insights into Fyl’s *life story* may be gleaned from an Oral History interview by David Zierler in 2020, as part of the Niels Bohr Library and Archives of the American Institute of Physics’ History Programs Division [9].

Our topical issue is comprised of 49 contributions covering a broad range of topics, which advance the understanding of soft and biological matter systems from physical and chemical aspects. More than 200 scientists globally contributed to this noteworthy *Festschrift*, which is divided into thematic categories. The first theme is focused on equilibrium and non-equilibrium soft matter systems, including topics associated with polymers and colloidal systems, in uncharged and charged systems, where Pincus has made lasting contributions [Group A, references 10–21]. In addition, other contributions are concerned with liquids, flowing and active matter, and granular systems [Group A, references 22–31]. The second theme groups together a large number of contributions that are focused on biological physics, including properties of the cell cytoskeleton and associated proteins [Group B, references 32–34], intrinsically disordered proteins [Group B, references 35–38], lipid membranes, membrane-associated proteins, and assembly and interactions of viral capsids with lipids and polymers [Group B, references 39–50]. A third group of contributions is in the nascent field of biomolecular and biomimetic materials at the crossroads between physics, chemistry,

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bioengineering, and materials science [Group C, references 51–56]. Finally, systems dealing with far-from-equilibrium states of matter in biology are addressed by a few contributions focusing on the physical properties of living cells [Group D, references 57, 58].

Fyl Pincus has made significant contributions to *soft condensed matter*—a niche field of physics and chemistry that was created in the 1970s and 1980s (also known then as “*complex fluids*”). We are convinced that Fyl is gratified to see how soft matter has blossomed in the twenty-first century into a flourishing field with an enormous impact on science, technology, and society.

David Andelman, Jean-Marc Di Meglio
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(D) Physics of Living Cells

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