Dynamic force measurements in soft systems

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The first attempt to measure the dynamic interaction between a deformable bubble and a solid surface was made in the 1930’s [1]. However, due to instrumental limitations and the lack of an appropriate quantitative model, only a qualitative explanation of experimental observations was possible.

Recent success in deploying accurately a liquid drop [2,3] or a bubble [4] as a probe on the cantilever of the Atomic Force Microscope (AFM) together with the development of a precise quantitative model [5-7] of velocity dependent interactions involving deformable drops and bubbles facilitated the quantitative understanding of key features that contribute to revealing the advantages of using soft deformable probes to study dynamic interactions.

Applications include quantifying coalescence dynamics [8], making accurate measurements of repulsive Van der Waals interactions [9], elucidating the complex coupling between interfacial deformations and oscillatory structural forces [10] and revelation of the effects of gas types on bubble-bubble interactions [11] will be discussed.

In addition, the elusive issue of determining absolute separation, which is particularly acute in deformable systems, has been addressed by combining confocal microscopy [12] with AFM measurements.