

Ben-Gurion University of the Negev
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Liquid interfaces: where order emerges from disorder

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Abstract

Bulk *solids* exhibit long range three-dimensional order. So do their surfaces, although surface reconstruction to a different order often occurs. By contrast, bulk *liquids* exhibits short range order, extending to distances of a few molecules only. A fundamental question that we (and many others) have been exploring is whether the termination of a bulk liquid by an interface could induce molecular order in the near-interface region, and if yes, what would be its characteristics. Answering this question experimentally proved to be far from simple. The advent of synchrotron-based surface-specific x-ray diffraction methods, and, in particular, of high-energy beamlines just a few years ago, opened the way for studies of liquid surfaces and deeply buried interfaces with high accuracy and atomic resolution.

Following a brief introduction to the x-ray methods used, a few seminal studies of liquid/vapour interfaces, e.g. water, liquid metals, and room temperature ionic liquids will be discussed. The main body of the talk will focus on recent, and ongoing, atomic resolution structure studies of interfaces, made possible by the recent advent of microfocus, high-energy, beamlines at third-generation synchrotrons. These studies will include the archetypical hydrophobic/hydrophilic interface of water and oil¹, surface freezing in surfactant-decorated oil/water interfaces², ordered liquid/liquid electrochemical interfaces³, and interfaces of room-temperature ionic liquids⁴, a novel class of liquids currently under intensive study as possible “green” replacement for polluting solvents and working fluids currently used in many applications.

¹ M. Fukuto et al., *Phys. Rev. Lett.* **117**, 256102 (2016).

² L. Tamam et al., *Proc. Nat. Acad. Sci. USA* **108**, 5522(2011); S. Guttman et al., *ibid.* **113**,493(2016).

³ A. Elsen et al., *Phys. Rev. Lett.* **104**,105501 (2010); *Proc. Nat. Acad. Sci. USA* **110**,6663 (2013).

⁴ D. Pontoni et al., *Soft Mat.* **13**,6947(2017); J. Haddad et al., *Proc. Nat. Acad. Sci. USA, Early Edition, January 22, 2018*, doi:10.1073/pnas.1716418115; L. Tamam et al. *Phys. Rev. Lett.* **106**,197801 (2011); M. Mezger et al., *Proc. Nat. Acad. Sci. USA* **110**,3733 (2013); P. Reichert et al., *Faraday Discuss.* **206**,141(2018).

Date & Location:

Tuesday, November 13, 2018, 11:00

Lecture room, Physics Building (ground floor)

