Surfaces in relative motion: bionanotribological investigations

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Abstract:

Tribology is the science of friction, adhesion, lubrication and wear. Continuous miniaturisation of technological devices like hard disc drives and biosensors increase the necessity of understanding tribological phenomena at the micro- and nanoscale.

Biological systems show optimised performance also at this scale. After all, Nature is an "engineering office" which has been "in business" for millions of years. Examples for biological friction systems at different length scales are bacterial flagellae, joints and articular cartilage and muscle connective tissues[1].

Our model system for bionanotribological investigations are diatoms[2], for they are small, highly reproductive, and since many of them are transparent, they are accessible with different kinds of optical microscopy methods. Furthermore, benthic diatoms have proved to be rewarding samples for mechanical and topological *in vivo* investigations on the nanoscale[3].

There are several diatom species which move (e.g. *Bacillaria paxillifer* forms colonies in which the single cells move along each other), or which can – as cell colonies – be elongated a major fraction of their original length (e.g. *Ellerbeckia arenaria* colonies can reversibly be elongated by one third of their original length). Therefore, we assume that some sort of lubrication is present in these species. Our endeavours in diatom bionanotribology will comprise techniques like atomic force microscopy, histochemical analysis, infrared spectrometry, molecular spectroscopy and confocal infrared microscopy.

References:

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