Title:
Advanced simulation of soft materials

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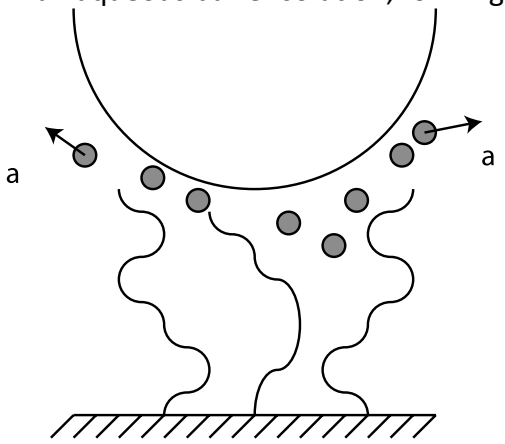
Short Description:
The mechanical behavior of biological materials is currently a very active research topic. The lack of effective replacements for some human tissues motivates a better understanding of these tissues as well as their replacements. For example, lubricating mechanisms of articular cartilage are not yet fully understood. Cartilage, as well as all other biphasic materials, can be modeled as a solid mesh impregnated by a fluid. However, such biphasic materials are challenging to model. This is best demonstrated in a recent study that aimed to model the nanoindentation of hydrogels - also considered a mimic for cartilage – by means of finite element and analytical methods. Interstitial fluid pressurization is believed to be one of the main load-carrying phenomena and was shown to play a major role in frictional properties. However, an effective modeling approach, or a methodological simulation-based approach for prediction of the properties of such materials remians elusive. In this work, we propose an effective method for the modeling of poroelastic materials in liquid environments. The experimental part of the work consists of colloidal nanoindentation of a thin layer of poly acrylamide (PAAm) brushes in an aqueous buffer solution, forming a biphasic soft material.



Soft materials nanoindentation