



26-30 octobre 2026



<https://jmc2026.sciencesconf.org/>

MMM03: Soft, deformable solids: from fundamentals to applications

Organizers: Nicolas BAIN (ILM, CNRS), Ambre BOUILLANT (MSC, CNRS), Martin COUX (SVI, CNRS/SGR), Claire DESSALLES (ILM, CNRS), Vincent BERTIN (IPNHYN, CNRS), Antoine MONIER (LOF)

Invited Speakers: Manon L'ÉSTIMÉ (LadHyX, CNRS), Chris MACMINN (University of Oxford), Irène NAGLE (Delft University of Technology)

Content:

Soft solids are materials which qualify as solids, but that are easily deformable to large extents in stretch, shear, compression, or bending. Daily-life examples encompass the tissues in our body, the food in our plates, and the glue of our tapes, to name a few. On a larger scale, soft solids are omnipresent in the biological world, in cosmetics, in the food industry, and in civil engineering. In the past 15 years, the consequences of their softness have been under intense scrutiny by the physics community. Their response to minute forces was coupled to capillarity [1-3] (Fig.1 A), phase change [4-9] (Fig.1 B), lubrication [10] (Fig.1 C), adhesion [11-12] (Fig.1 D), friction [13-14], osmotic fluxes [15] (Fig.1 E), cell locomotion and growth [16-18] (Fig.1 F), and so on. In parallel, their ability to accommodate large deformations was exploited in shape morphing designs [19] (Fig.1 G), and studied in the context of fracture and puncture [20-21] (Fig.1 H). Applying this recently acquired knowledge to solve pressing world challenges, however, will require associating many of these fundamental aspects and an all-around understanding of the effects of the material compliance.

In this mindset, this mini-colloquium aims to gather the vast physics community which investigates and leverages softness in solids. We hope that crossing the points of view will foster productive collaborations at the intersection of different softness effects, and trigger reflections on the applicative potential of soft solids.

This mini-colloquium falls within the topics of the GDR Mécanique et Physique (MePhY), the GDR Interfacial Soft Matter (ISM), the GDR SoPhy (Soft Physics for Hard Materials), as well as the GDR Solliciter LA Matière Molle (SLAMM), and is supported by the SFP's Physics & Life division.

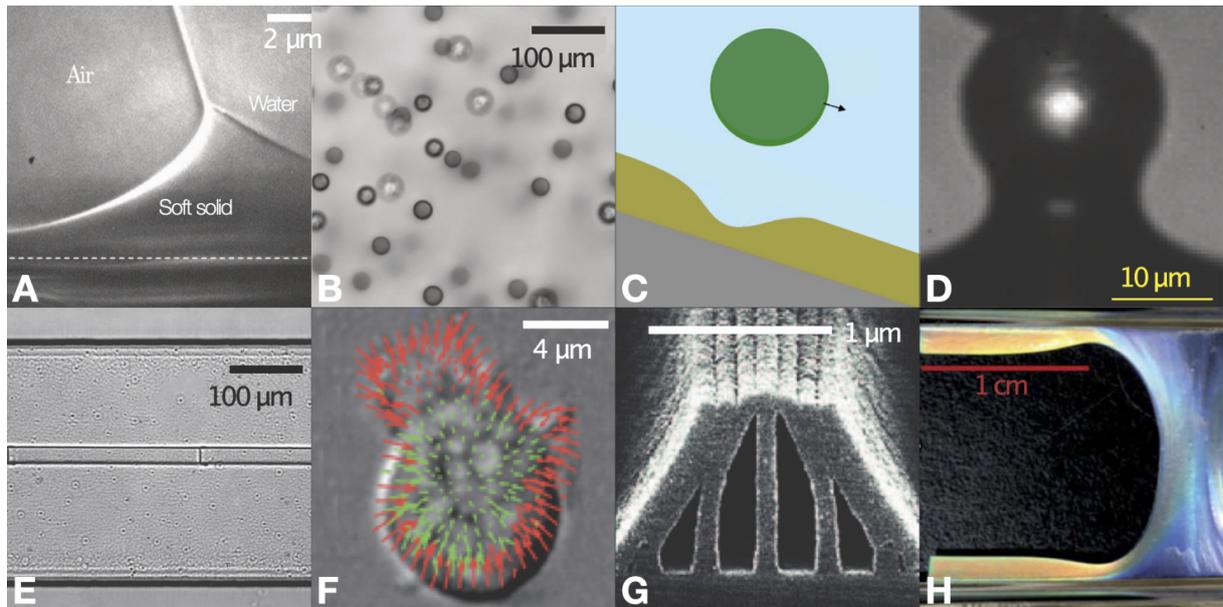


Figure 1. (A) X-ray imaging of a three-phase contact line [4]. (B) Phase separated droplets in a soft matrix [8]. (C) A bead sliding down soft solid deforms it [11]. (D) Glass bead adhering to a soft solid [12]. (E) A soft membrane separates two fluids in a microfluidic channel [15]. (F) Forces exerted by a dictyostelium cell on a soft substrate [16]. (G) ‘Tepee’ structures formed as lamellae adhere together after rinsing and drying step [6]. (H) Fracture propagating in a soft hydrogel [21].

- [1] J. Bico, É. Reyssat, and B. Roman, *Annu. Rev. Fluid Mech.* 50, 629–659 (2018).
- [2] R. W. Style, A. Jagota, C. Y. Hui, and E. R. Dufresne, *Annu. Rev. Condens. Matter Phys.* 8, 99–118 (2017).
- [3] B. Andreotti and J. H. Snoeijer, *Annu. Rev. Fluid Mech.* 52, 285–308 (2020).
- [4] S.J. Park, B.M. Weon, J.S. Lee, J. Kim, and J.H. Je, *Nat. Commun.* 5(1)4369 (2014)
- [5] B. Roman and J. Bico, *J. Phys.: Condens. Matter* 22, 493101 (2010).
- [6] T. Tanaka, M. Morigami, and N.A.N. Atoda. *JJAP*, 32, 6059 (1993).
- [7] A. Bouillant, C. Henkel, U. Thiele, B. Andreotti, and J. H. Snoeijer, *Phys. Rev. Lett.* 134, 188204 (2025).
- [8] K. A. Rosowski, T. Sai, E. Vidal-Henriquez, D. Zwicker, R. W. Style, and E. R. Dufresne, *Nat. Phys.* 16, 422–425 (2020).
- [9] L. Séguéy, A. Huerre, and S. Protière, *Phys. Rev. Lett.* 135, 208201 (2024).
- [10] T. Salez, and L. Mahadevan, *Journal of Fluid Mechanics*, 779m 181-196 (2015)
- [11] V. Bertin, A. Oratis, and J. H. Snoeijer, *Phys. Rev. X* 15, 021006 (2025).
- [12] K.E. Jensen, R.W. Style, Q. Xu, and E.R. Dufresne, *Phys. Rev. X*, 7.4, p041031 (2017)
- [13] I. Andrade-Silva, T. Godefroy, O. Pouliquen, and J. Marthelot. *EPJ Conf* (2021).
- [14] C. R. Picu. *Mech. Res. Commun.* 114, 103605 (2021).
- [15] J. Renaudeau, P. Lidon, and J. B. Salmon, *Lab on a Chip* (2025).
- [16] H. Delanoë-Ayari, J. P. Rieu, and M. Sano, *Phys. Rev. Lett.* 105, 248103 (2010).
- [17] C. Ji and Y. Huang, *Commun. Biol.* 6, 1169 (2023).
- [18] D. Dennis, P. Janmey, and Y.L. Wang, *Science* 310(5751) 1139-1143 (2005).
- [19] E. Siéfert, E. Reyssat, J. Bico, and B. Roman, *Nat. Mater.* 18, 24–28 (2019).
- [20] C. Creton and M. Ciccotti, *Rep. Prog. Phys.* 79, 046601 (2016).
- [21] M.A. Haque, T. Kurokawa, and J.P. Gong, *Soft Matter*, 8(31), pp.8008-8016 (2012).